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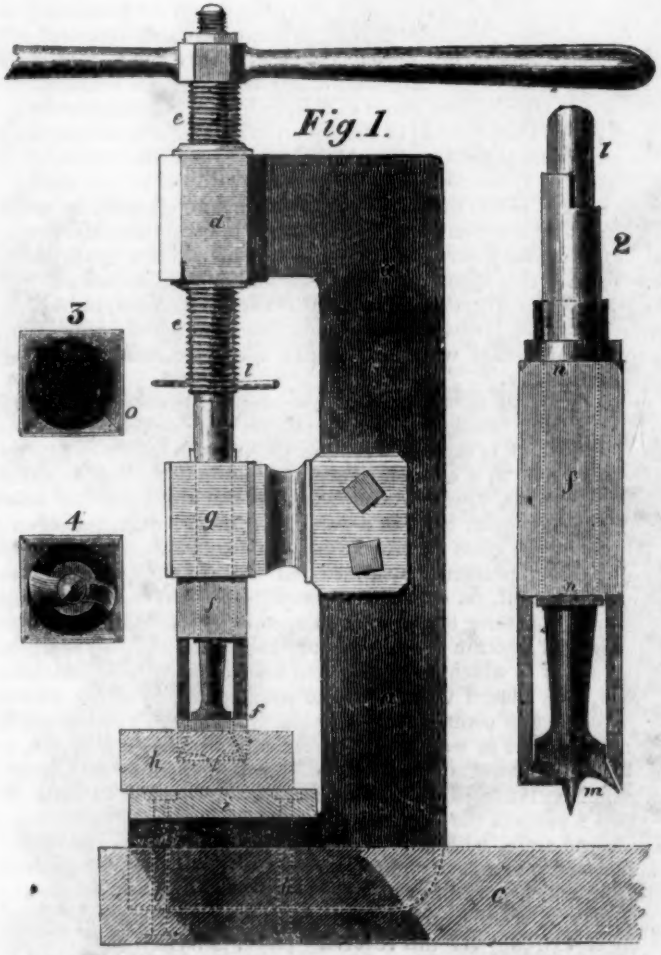

Hancock's machine for boring square holes and making mortices.

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It has been the determination, and the uniform practice, of the editor of this Journal, to mete the most impartial justice, in his accounts of inventions, discoveries, or improvements; he has felt keenly, the numerous instances in which American inventions have been claimed, and appropriated, by foreigners, who have thus filched from us that which we value more highly than we do our purses. The most safe, as well as the most honourable proceeding in this, as in other cases, is to adopt, and to act upon, the motto of the Welch druids, "the truth against the world." Our readers will agree with us in this opinion, and we therefore offer no apology for publishing the following account, which renders it evident, that an instrument operating upon the principle of the American square auger, was in use in London, prior to the invention of the latter, in this country; still we have not the slightest doubt of the originality of the square auger, so far as the understanding of the American inventor was concerned.

In our Journal for October, 1826, we inserted the report of the committee of Inventions of the Franklin Institute, on an auger for boring square holes; the invention of which was claimed, by a Mr. H. Branch; we were, however, subsequently informed that Mr. Branch was only the purchaser of a right from the inventor, a gentleman of New York. This account was published in the English Journals, and the editor of the *Register of Arts and Sciences*, (London) in his number for May last, furnishes the subjoined description of a machine for a similar purpose, of which a cut, from the same work, appears on the opposite page.

"*a a*, fig. 1, is a strong iron frame or support, fixed by screw bolts, *b b*, to the work bench *c; d* is an octagonal iron socket containing a brass bush, which is tapped to receive the vertical screw, *e e*; to this screw is affixed, by a circular tenon and mortice, the square perforating instrument, *f*, which accurately fits and slides up and down through a rectangular hole, in a guide of brass, *g*, when the screw *e* is turned by the cross handle at top; so that a square incision is made by direct pressure downwards, at the same time that the revolving centre bit, *m*, cuts out a completely round hole, the chips rising up, and passing out at the two open sides of the square cutter: *h* is a piece of wood in the act of being bored, the dotted lines showing the depth to which the perforation has reached: the small piece of wood, *i*, is placed underneath, to prevent injury to the cutting tool by coming in contact with the cross iron plate, *k*; the bolts, *b b*, passing through *i* as well as *k*, secure both firmly to the bench, *c*: this figure is drawn to a scale of one-third the size of the original model in Mr. Hancock's manufactory.

"Fig. 2 exhibits the cutting part of the instrument separately, on an enlarged scale, with the lowermost portion in section: the tenon, *i*, is inserted into a cavity in the screw, *e*, fig. 1, and made fast by a cross pin which goes through both; by this arrangement the instruments may be readily exchanged for others of different dimensions; the lower extremity of this revolving piece, is formed into a centre bit, *m*, which, owing to the collars, *n n*, cannot ascend or descend

without the square instrument, which accurately cuts out the angles beyond the range of the circular incision made by the former.

"The square cutting tool is made of a bar of steel, with a hole drilled out of the solid, in the manner shown by the end view, fig. 3, and the edges are then formed by filing and grinding them to the bevel, or angles, shown in section by fig. 2. Fig. 4 represents a similar view of the end of the instrument, but with the centre bit in its place.

"It will be readily perceived that a *square* tool, by repeating the incisions side, by side, close together, may be made to produce a mortice of the figure of *any* rectangular parallelogram, or, as workmen would say, an *oblong mortice*, of any length or breadth, larger than the instrument employed. The same effect may likewise be produced by a single operation; by arranging a series of centre bits, or circular cutters, side by side, with toothed wheels at their upper extremities, or axes, taking into one another so that they shall cut simultaneously, a single external angular cutter, embracing all the centre bits, would then suffice for that purpose.

"In like manner, any acute or obtuse-angled figure, any polygon, or any figure with curved sides, might be made of any size whatever.

"By the construction of the present model, it would be necessary in changing the tool, to change also the guide piece through which it slides. The screwing and unscrewing of the guides may, however, be avoided, by having tenons in the latter, of a uniform size, to fit into a mortice in the upright iron frame; and in manufactories where a great variety of mortices have to be made, we would, with submission, suggest another mode, in which the trouble of changing the guides would be still less: it is to have *a guide wheel*, turning horizontally on the upright bar, *a*, as its axis; on the circumference of the wheel should be made a series of apertures, corresponding with the form of the tools, and of the mortices, required. By this arrangement, indeed, most of the tools might be left in the guide wheel, ready to bring any one of them into action under the screw, by just turning the wheel round. Other modifications might be made to suit particular purposes, but we will not fatigue our readers by their explanation; being confident likewise, that the ingenious inventor would, if consulted, readily supply whatever adaptations might be required, with better arrangements than we can devise."

Immediately upon the publication of our account of the American square auger, Mr. Hancock, the inventor of the above described machine, invited the editor of the Register to witness its employment in his manufactory, where it had been used for a number of years: this invention has been presented to the public, Mr. Hancock having declined availing himself of a patent for his invention. Such machines are now manufactured for sale, in England. We insert the remarks of the editor, respecting the two instruments, as we deem them, in general, judicious, and correct.

"It does not appear to us that the employment of this machine would suit the private workman, unless it were in a branch of business where a great number of mortices were required of one size; in *manufactories*, however, where this is the case, its advantages would

soon be felt, no skill being required in using it; a boy, a perfect novice, may, by its aid, execute the work quite as well as the experienced workman, and with his eyes shut. *Chair-makers* would, we think, find it a useful appendage to their workshops, for making their mortices with greater accuracy and rapidity, and consequently render the chairs more firm and durable; as most of their mortices have to be made in a slanting direction, a cradle should be attached to the machine for enabling them to change the direction of the perforations. We do not see why such a machine could not be successfully employed by *wheelwrights*, in making mortices in the naves of wheels for the reception of the spokes. In the large workshops of *carpenters and builders* it might be extensively used in despatching a great deal of heavy framing; and in such work, particularly the making of framed doors, the machine might be so constructed as to perform the offices both of a mortice borer, and of a cramp to draw the jointed parts of the work into close contact. *Millwrights* might save a great deal of time and labour by the use of the machine; in short, it would prove of great utility in every mechanical operation, in which many mortice holes are required.

"In Mr. Branch's instrument, it appears to us that the operation must be very unsteady when compared to that of Mr. Hancock; and we cannot conceive how the little central entering screw, can have sufficient power to draw the instrument into the wood, and consequently, that a great deal of inconvenient direct pressure must be given at the same time that it is forced round, laterally; and if the whole instrument does not perforate at every turn, a depth equal to the distance between the threads of the entering screw, the latter is of no assistance whatever. To work with two or more such square augers at a time, side by side, as mentioned in the American account, with workmanlike precision, and unaided by any other mechanical arrangement, would, we think, require the strength of a Hercules; that of an ordinary man, we feel assured, is unequal to it. Mr. Hancock's machine being a fixture, its motions are steadied and regulated by the revolutions of a screw, which passing through a fixed nut, confers upon it all the powers of the screw press, and it cannot fail to make its perforations with a certain and uniform progress.

"We ought not to close this account without mentioning Mr. Hancock's method of making the tenons to his mortices, the fitting of which is so accurate and tight, as, seemingly, to restore to the wood its former state of solidity. They are cut out by means of two circular saws in a lathe, placed apart, at a distance equal to that of the sides of the mortice: by this means, they must, obviously, be formed with great truth and facility."

It is a fact, that the American auger will only bore wood of a medium hardness; the small screw will not hold in the softer woods, such as cedar, and white pine, and the harder kinds of oak, hickory, &c. present too powerful a resistance to the entrance of the square socket. In boring the hubs, or naves, of wheels, &c. where two or three augers and sockets are used, the small screw is aided by pressure, made in different ways, against the head of the instrument, and has been found to answer perfectly well.

ESSAYS ON BLEACHING.

By James Rennie, A. M. Lecturer on Philosophy, &c. &c. London.

No. V. PROCESSES FOLLOWED IN BLEACHING.

SECTION IV.

7. *Souring.*—Since the time of Dr. Holme, who introduced sulphuric acid souring, there has been but little improvement made in this department of the Art of Bleaching. It always follows the boiling in alkaline leys, and is among the finishing processes. The goods are removed from the dash wheel to the souring vats, and exposed to the action of the sulphuric acid, in the same way as they are steeped at the commencement of the operation. It assists and expedites the process very much, for a reason which was formerly given in the directions for bucking, if the goods are dried before being put into the sour, but for this there is not always time. The acid is to be diluted till it can be taken with safety into the mouth, so as to indicate to the taste the strength of strong vinegar, or lemonade; or it may be tried by the hydrometer, and Mr. Parke's tables, the specific gravity being proportioned, and accommodated, to the fabric of the goods. The Irish bleachers use 100 parts of water, to dilute one part of sulphuric acid; the French at Mayence 60, to one, by measure. The same precaution is to be taken here, as in bucking, with regard to the equal mixture of the acid and the water with which it is diluted; for as the acid is poured into the water, and the former being twice the specific gravity of the latter, the acid will sink undiluted to the bottom, if care be not taken to agitate and mix it. Want of attention to this circumstance, was one of the causes which prevented the speedy introduction of this mode of souring, when it was proposed; for the bleachers being ignorant of the imperfect state of the mixture, fearlessly put in their goods, which were speedily corroded. The goods are usually suffered to remain in the sour for twelve hours; if they are put in, dry, a shorter period will be sufficient, and it will be farther expedited by having the water milk-warm, or even as warm as the hand can easily be held in it. It is of the utmost consequence to have the remains of the acid completely removed after the souring, because if the cloth is allowed to dry before washing, the condensation of the acid will infallibly corrode it. The less the goods are pressed in the vat, the more perfectly they will be exposed to the action of the acid; it was probably want of attention to this, which gave rise to prejudices against the use of acids. Whether they are sufficiently cleared of it, may be ascertained by applying the tongue, when the absence, or presence, of an acid will indicate the necessity for the continuance, or discontinuance, of the washing.—(*Dublin Report*, 1791.)

8. *Finishing Process.*—After souring, and a thorough washing, the goods are examined, to see whether the operations have been successful in bringing them to a pure white. For this purpose, as the perfection of the bleaching can be better judged of when they

are wet, the pieces are to be run through water, and passed from it over a roller, so gradually as to give the superintendent an opportunity of examining every inch of the surface. Cottons intended for calico printing, may be run once or twice through a madder copper, of the temperature of 180°, which will mark any part that may be imperfectly bleached. If any are found not to be fully white, they are returned to the workmen, to go through a second course of bucking, immersion, and souring. Those which are found to possess the requisite whiteness, are pressed clear of water, and a bluish cast given to them, to make the white look clearer. This is done in two ways: either by diffusing, in the usual way, a small quantity of fine indigo, through a hot, or cold, solution of white soap, and immersing the goods in it; or they may be immersed in a solution of white soap, without any kind of blue, while it still contains a small portion of the acid. If the latter is employed, the small portion of acid in the cloth, immediately exhibits, in the vat, a slight tinge of Berlin blue, arising from the particles of iron combined with the alkali of the soap, which tinge is distributed very equally on the whole piece. This method is liable to uncertainty from a nicety of management required for complete success, and only those, therefore, who have some experience should attempt it; but it is recommended by its economy. A sufficient quantity of the solution of indigo must be prepared for every portion of goods to be blued, that it may not be necessary to make additions to it during the process, otherwise different shades of blue would be produced. The goods should be plunged into it at the moment the colour is suspended, and they should be left no longer than is necessary for imbibing it. It is not easy to account for a fact observed by Des Charmes, that some pieces, after being taken out of the bleaching liquor, and having undergone an immersion in the sulphuric acid sours, still retain a sufficient quantity of muriatic acid (derived from the chlorine) to cause them to assume a yellowish tinge, after they had passed through an infusion of indigo. This tinge, indeed, is common to almost all goods which pass through any preparation of chlorine, but is commonly removed with ease, by crofting, souring, or immersion in the solution of soap. For the calendering, and the manipulations connected therewith, I refer to Des Charmes, as it does not fall within my plan.

9. *Epitome of all the processes.*—I shall now bring all the processes into one distinct view, giving Mr. Ramsay's account of the order, and number, of them employed in Glasgow, and in Ireland. A parcel, says he, of 360 pieces of linen of the sort called Britanicas, weighing 3600 lbs. are first steeped, then

1. Bucked with 60 lb. pearl-ashes, washed, crofted.
2. Do. 80 lb. Do. Do. Do.
3. Do. 90 lb. pot-ashes Do. Do.
4. Do. 80 lb. Do. Do. Do.
5. Bucked with 80 lb. pearl-ashes, washed, crofted.
6. Do. 50 lb. Do. Do. Do.
7. Do. 70 lb. Do. Do. Do.
8. Do. 70 lb. Do. Do. Do.

9. Soured one night in diluted sulphuric acid, and washed.
10. Bucked with 50 lb. pearl-ashes—washed—crofted.
11. Immersed in oxymuriate of pot-ash or lime twelve hours.
12. Boiled with 30 lb. pearl-ashes—washed—crofted.
13. Do. do. do. do. do.
14. Soured—washed—blued—mangled or calendered.

10. *Bleaching of Calicoes—Muslins—Hose—Thread, &c.*—In bleaching for Calico printing; the process is very similar to that we have already detailed; the chief difference lies in the number of the buckings, and the strength of the leys, as the colouring matter of cotton is much more soluble than that of linen;—and sometimes, when the weather is favourable for crofting, intermitting the immersions in the chlorine preparations. To remove, or destroy, the reddish hue arising from boiling printed cottons in madder decoctions, which prevents the printed colours appearing to advantage, the goods are usually boiled for some time, in bran and water, and then exposed to the air, by wet crofting. Mr. Grimshaw, of Belfast, in 1796, obtained a patent for clearing printed goods coming from the madder copper, by using the grains after brewing malt liquor, (Draff *Scotice)* instead of bran.—*(Rees' Cycl. Bleaching.)* In bleaching ginghams and pulicates, where part is woven coloured, and part white, the oxymuriate of potash is found to be the best agent, together with very dilute sours of sulphuric acid. No bucking is used, but the goods are gently boiled in a solution of soap, previous to immersion in the chlorine preparation. When the whites have been bleached before weaving, the goods are merely washed, and put into a sulphuric acid sour. The chief difference in bleaching thread—hose—night-caps, and other small articles, consists more in the manipulations, than in the chemical process, for which I refer to Pajot Des Charmes *passim*, for minute and practical directions, for wringing—folding—unravelling, &c. &c. For the Indian mode of Calico bleaching, see Dr. F. Buchanan's journey through the Mysore, vol. i. p. 223.

SECTION V.

11. *Steam Bleaching.*—The compressed steam of boiling alkaline leys, was, some time ago, recommended for the purposes of bleaching, by Chaptal, *(Chim. app. aux. Arts,* III. 100, and *Journ. de Physique pour* 1801): chiefly for cotton goods. They are continually, and repeatedly, immersed in an alkaline ley, made in the usual manner, and then exposed to the action of the vapour arising from the same ley, heated to 220° or 230° Fahr. By this means the French chemists, Chaptal and Delametherie, procured good whites, without injury to the fabric of the cloth, and without using any preparation of chlorine. They found that the resinous, and other colouring matters of the cloth, which are insoluble in a diluted ley of the temperature of boiling water, become soluble in a vapour of the same, when the heat is carried a few degrees farther. The immersion of the goods in the ley, and their subsequent exposure to its vapour, are successively repeated, till the goods become completely white.

Chaptal performed an extensive experiment on the same principle, in order to introduce it for domestic washing, *(see Ann. de Chim.* xxxviii. 291.) He washed by this method, with great success, 200 pairs of sheets belonging to the hotel Dieu at Paris. In giving an account of this, Mr. Parkes observes, that brown calicoes, which have only been *once* boiled, after having been all night in the whale-boiler, are often completely white, where they have been in immediate contact with the iron in the midst of the apparatus, while the other parts were almost unchanged. The process of steam bleaching, the same author remarks, will always be attended with danger, as the force of the steam, if the valves be overloaded, or deranged, may burst the apparatus. It seems to be but a slight modification of the French process, for which Mr. Turnbull of Bonhill has lately obtained a patent. *(See Repertory of Arts.)* He immerses his goods, either cotton or linen, in a hot solution of caustic alkali, and then exposes them to the vapour of simple water, when loaded with the alkali in which they have been immersed. The previous and subsequent processes are the same as in the ordinary mode, and the chief advantage of this plan, seems to be in the saving of alkali; much fewer baths of ley being necessary than in the common method, as the heated vapour increases the alkaline action. It does not, however, supersede the chlorine preparations, as good whites cannot *easily* be procured without one immersion in an oxymuriate. Slabs of stone, cramped with iron, are found the best apparatus for steam bleaching. More information on this subject may be had in *D'Orellie. Essais sur le Blanchiment.* M. Cadet, thinks that the rationale of this process consists in the alkali exercising over the oil, or the resin, of the cloth, a double attraction: first, directly with the constituent principles of the oil; and secondly, predisposing and favouring the combination of the oxygen of the atmosphere, with the oleaginous or resinous matters. This appears, he thinks, from the oil, of the soap, being, when decomposed by an acid, always more concrete, and more oxygenated than it was before. *(Ann. de Chim.* No. 131.*)*

12. *Paper Bleaching.*—The title which I have chosen for this section, comprehends two different processes: one for bleaching rags, and other materials, from which paper is at first fabricated; and another, for refabricating paper from old, written, or painted, papers. We are chiefly indebted to the French chemists for these processes, which may be seen in various parts of the Annales de Chimie, and in Des Charmes' Art of Bleaching. Rags, when gray, or coloured, are to be separated and ground in the paper-mill in the usual way, till brought to a sort of uniform consistence, having been previously macerated, according to their quantity and tenacity. The mass is then treated with an alkaline ley, similar to what has already been directed for piece goods. It is next treated with either of the preparations of chlorine, which is thought most convenient. I believe the oxymuriate of potash, which was lately the most common, has now given place, in Britain, to the oxymuriate of lime. If this immersion do not produce the desired effect, which does not often happen if the colours are tenacious, such as red and blue, let the treat-

ment with the alkaline leys be repeated, and follow it with another bath of the chlorine preparation. Then sour the whole in a bath of sulphuric acid, much diluted, and cold; for when hot, its action will be less effectual. Water is then to be run upon it, till it come off without colour, or indication of acidity. Black, is the most easily discharged colour, and will seldom require being treated with ley; one steep of sulphuric acid, and another of oxymuriate of lime, being commonly sufficient to produce a good white. The mass is then ready for being manufactured. In this manner may be bleached, at a trifling expense, and in a few hours, a sufficient quantity of materials for making as much paper as will print a large edition, of the largest work, in the English language. Old printed or written paper, again, is first to be sorted according to its quality, and all the yellow edges cut off by the bookbinder's plane. A cwt. of this paper is to be put, sheet by sheet, into vats sufficiently capacious, with 500 quarts of hot water. The whole is to be stirred for about an hour, and as much water gradually added as will rise about three inches above the paper, and to be left to macerate for four or five hours. It is then ground, coarsely, in the mill, and boiled in water for about an hour, taking care to add, before it begins to boil, thirteen quarts of caustic alkaline ley. After boiling, it is macerated in the ley for twelve hours, when it is pressed, and, if sufficiently white, is forthwith manufactured into paper, if not, the process is repeated. Written paper, may be bleached by sulphuric acid alone, and printed paper by alkaline or soap leys, but the above process is the most effectual, and the expense is exceedingly trifling. Paper which has been written, or printed, may even be bleached without destroying the leaves, by treating them with the same chemical agents, taking care to arrange the sheets, alternately, between cloths, in the same manner as the paper makers dispose their sheets of paper when delivered from the form. (*See Chaptal, Chim. app. aux Arts* III. 108, and *Ann. de Chim.* I. 69.)

SECTION VI.

13. *Straw Bleaching.*—Our milliners, not pleased with the yellow colour, which the straw of which hats are made, originally possesses, or urged by the all prevailing passion for novelty, have lately been desirous of obtaining white straw; and several attempts have been made to bleach this substance with the usual agents. Sulphuric acid has been found to succeed best in those incipient attempts, while the oxymuriates, and the simple chlorine gas, are said to injure the texture, and destroy the natural varnish, of the straw, which is its greatest beauty. It is probable, however, that this has proceeded from unskilful management, for in other departments of bleaching, the corrosive effects of the chlorine, when combined with earths or alkalies, and properly diluted, are found to be as easily prevented, as that of sulphuric acid, while its power of destroying a colour, is greatly superior.

14. *Silk Bleaching.*—In Hindostan, as we learn from Dr. F.

Buchanan, in his journey through the Mysore (vol. i. p. 223,) in order to bleach their silks, they take 5 seers (a seer is 4835 lbs.) of silk, either raw or in thread. 3 seers of *soulu*, or Indian pearl soda, and one and a half of quicklime, mixing the soda and lime with 4 or 5 seers of water. This is boiled for an hour, and the silk dipped into it, and afterwards dried. Then they take 3 seers of this silk, 3 seers of soulu, one dudu (6.47D ra.) of indigo, and 18 seers of water, and boil the whole for about two hours. The silk is to be washed in hot limpid water, and then dried. This process requires much care; as, if there be too little soda, the goods will be spoiled, and if they are boiled too little, a good white will not be produced.

The Chinese mode of bleaching the silk denominated Nankin, without boiling or ungumming it, is supposed to have been discovered by M. Baumé, who has given an elaborate memoir on the subject, *Jour. de Phys.* 1793. M. Baumé (loc. cit.) directs, to dispose six pounds of yellow, raw silk, in a stone-ware vessel, and to pour over it a mixture, previously made, of about forty-eight pints of spirit of wine, and twelve ounces of very pure muriatic acid, the whole being then covered up, and left to digest, till the liquor change from green, to yellowish brown. The liquid is then drawn off, and unmixed spirit of wine is poured upon the silk till it comes off colourless: it is then allowed to drain, or *seep*, as the Scotch bleachers would say, when it is ready for a repetition of the process. The second steeping continues longer than the first. The third maceration is made in pure spirit of wine, for a day, when it is drained, and sprinkled with water, to recover all the spirit; it is then washed clear of the acid by putting it in a woollen bag, and keeping it in a running stream for six hours. The water, and the muriatic acid, ought to be completely free from the nitric acid, otherwise the goods will be spoiled. Rigand found the process to be one half more speedy, when the vessels were exposed to the sun.

When the silk is to be deprived of its gum, the process is different. A ley of white soap is made, by boiling in water 30 lbs. of soap, for every 100 lbs. of silk intended to be bleached, and in this the silk is steeped till the gum is dissolved and separated. It is then put into bags of coarse cloth, and boiled in a similar ley for an hour. By these processes it loses 25 per cent. of its original weight. The silk is then thoroughly washed, and steeped in a hot ley, composed of a pound and a half of soap, and 90 gallons of water, with a small quantity of litmus and indigo diffused. After this, it is carried to the sulphuring room: two pounds of sulphur are sufficient for 100 lbs. of silk. When these processes are not sufficiently successful, it is washed with clear *hard* water and sulphured again. (*Des Charmes*, p. 294.)

13. *Wool Bleaching.*—Wool is commonly bleached by means of fumes arising from the slow combustion of sulphur; by which is meant, combustion in the atmosphere, in contradistinction to that of burning sulphur in oxygen gas, or with a mixture of nitre. (*See Parke's Chem. Ess.* iv. 154.) The former, Scheele has shown by luminous experiments, is the most effectual for bleaching wool. The

process has been known and practised these sixteen hundred years, as appears from Apuleins, *(De Asins Aures.* ix. 136,*)* who tells us of a man, that having had an illicit amour, was nearly suffocated in the house of a fuller by hiding under a wicker coop where cloth was hung to be whitened by the fumes of burning sulphur: "*Contigit vinaínea cavea; qual lacineas circumates, suffusa candido fumo sulphuris inalbabat.*" It is even mentioned by Pliny *(Hist. Nat.* xxxv. 15.*)* to have been employed so early as the first century. The wool is first prepared according to the purposes for which it is intended, by treating it with leys composed of wine and water—or of solutions of soap. By this process, it is cleared of a great quantity of loose impurity, and grease, which is always found in it, wool often losing no less than 70 per cent. of its weight. The heat of the ley must be carefully attended to, as a high temperature is found to fix the unctuous matter, or yolk, of the wool. After washing, it is taken to the sulphur chamber, where it is exposed to the vapour, from five to twenty hours, according to circumstances. This is again washed, and then immersed in a bath composed of pure whiting and blue. It is then exposed a second time to the fumes of the sulphur, and washed with a solution of soap, which renders it of the proper whiteness. It is of importance to remark, that there should be no iron about the sulphur chamber, as, by becoming oxydized, it might spot the goods. The cloth, or wool, also, which has been sulphured, ought not to be laid immediately on wood, as the sulphur will dissolve the resin, or gum, of the wood, and produce stains. The final washing with soap, takes away the harshness of the wool, and the disagreeable odour left in it by the sulphur. This mode of bleaching, however, only whitens the surface of the goods, which has led recently to the employment of liquid sulphurous acid. The process of its application has not come to my knowledge. For farther information consult Pagot. *(Des Charmes,* 6. 28.*)*

16. *Wax Bleaching.*—According to Fourcroy, *(Syst. Connais. Chim.* x. 343.*)* wax derives its yellow colour from the fumes, and moisture, which proceed from the bodies of the bees in the hive, as well as from the colouring matter of the vegetables whence it is derived. This opinion seems to have been formed upon the erroneous notion that wax is derived immediately from the pollen; the falseness of which, the experiments of Huberson, have completely exposed. It is a pure animal secretion. In order to bleach it, pieces of it are melted so as to fall upon a cylinder which is half dipped in cold water, from which, as it rolls, it is made, by a simple contrivance, to pass into this water. The wax is, by this means, formed into thin ribands, which are exposed to the sun and air upon cloths, till it acquires the requisite whiteness, when it is, improperly, called virgin wax. This is the account given by Fourcroy as the French method: Parke has copied it, nearly verbatim, as the method followed in England, *(see Syst. Connais. Chemique,* x. 343. and *Chem. Ess.* iv. 155.*)* We have a different account of the French mode in Des Charmes: The ribands of wax he directs to be exposed to the action

of water, impregnated with chlorine gas, which succeeds better than any of the oxymuriates.

We have, in the Annale de Chimie, (No. 131.,) a very curious account, given by M. Cadet, of the mode of bleaching the vegetable wax produced from the *Myrica cerifera* of America. It is effected by the sulphuric acid, or by chlorine; but as the wax does not sink in those fluids, means have to be invented to multiply the contact either by cutting the wax into slices, and sprinkling it with the liquids, or shutting it up, when sliced, in a cask into which they are then introduced. A speedier method would be to place the wax, cut into small pieces, in alternate strata with the oxymuriate of lime, leaving it in this state for some time, dry, and in contact. The salt and acidulous water are then to be decomposed by sulphuric acid, pouring in the water gradually, till no more muriatic gas be disengaged. Add then a large quantity of water, stir the mixture, and the insoluble sulphate of lime will fall to the bottom, while the bleached wax will float on the surface.

Essay on Earthenware and Porcelain.

[From Parke's Chemical Essays.]

(Continued from page 227.)

As the number of potters has increased very much, within the last 50 years, the competition has become so great, that every manufacturer is under the necessity of consulting economy, and of sometimes sacrificing the utility and goodness of the ware, for the sake, either of appearances, or of adopting the cheapest modes of manufacture that can be devised. To one of these causes, may be attributed the introduction of *bones* into the manufacture of porcelain. Of this article there is now so large a consumption in the Staffordshire potteries, that some of the great manufacturers have extensive rooms, which are used solely for the reception of bones. Animal bones are composed of lime and phosphoric acid, in different proportions, according to the age and species of the respective animals to which they belonged. These are either bought of the indigent bone-collectors in the country, and then burnt and ground by the potter, or they are purchased ready burnt and ground for use, directly from those who distil volatile alkali, or spirit of hartshorn. It is, however, generally known to the china manufacturers, that this article is injurious to the texture of the ware: its use, therefore, cannot be justified on any account whatever.

I allow that ground bones have the effect of rendering the goods very white, and also that they produce a transparent appearance; but I doubt whether this be a real transparency, or only a deception. Thus far, however, one may venture to assert, that the modern English porcelain, which has the usual proportion of bones in its composition, is of much less specific gravity than it ought to be,* and is

* For the specific gravity of good porcelain, see Note, page 225.

very apt to crack with hot water. As the base of animal bones is phosphate of lime, it might be worth while for the potter who is determined to use bones, to try whether the *native* phosphate of lime* can be useful in making porcelain, and if phosphate of alumina may also be employed in this manufacture.

In returning to the subject of glazing, it will be proper to state, that the common earthenware would be too porous, and many kinds of fluids would pass through it, were it not defended by an artificial covering of permanent glaze. It became necessary, therefore, to contrive a composition which should vitrify and flow in the fire, so as to cover these materials of earth with an entire coating of perfect glass.

Such a glaze having been found in a mixture of oxide of lead† and silica,‡ as mentioned above, a certain proportion of each of these, ground to an impalpable powder, is thrown into a tub of water, and stirred therein till the mixed powder becomes suspended, and uniformly dispersed throughout the fluid.

The glaze having been thus prepared, it is applied to the ware in the following manner. A workman to whom this duty belongs, receives the goods from a boy, who delivers them to him, one at a time; and as he receives each single piece, he dips it in the liquid, lets it drain for a moment, and then, placing it on a board standing beside him, he is ready to receive another piece, which he immerses in like manner.

It is in this way that the glaze is applied to all the various articles which are made of the common earthenware; and as it is only partially baked, or in the state of biscuit, when it is immersed in the glaze, a sufficient quantity attaches itself to the surface, which, when it has been fused, will form over it a complete covering of glass. This mixture has great fusibility, though silica alone does not melt in the focus of the most powerful burning mirror. Mr. Hare, however, fused it completely, by submitting it to the flame of a stream of mixed oxygen and hydrogen gases; and found that it formed, when cold, a kind of enamel.§

There are, however, strong objections to this mode of glazing pottery. The men who work in it for a considerable time, are apt to become paralytic, probably from the lead:‖ and where acids, which have the power of dissolving the lead, are employed in preparing condiments for our food, such a glaze must be extremely unwholesome.

* A memoir by Hassenfratz "On the native phosphate of lime," may be seen in the *Annales de Chimie*, tome i. page 191. Likewise some "Remarks on phosphate of alumina, and on a mountain of calcareous phosphate," by Proust, in the same volume, page 196.

† The French potters, instead of an oxide of lead, use the common galena, or sulphuret of lead, for this purpose.

‡ Silica was formerly known by the name of the *vitrifiable* earth, because mixed with an alkali, it possesses the property of fusing into a transparent glass.

§ *Philosophical Magazine*, vol. xiv. page 304.

‖ Some directions for the prevention of this malady will be found in *The Chemical Catechism*, tenth edition, page 101.

Aware of the pernicious effects of lead, when taken into the stomach, M. Fourmy, an ingenious manufacturer at Paris, has prepared water-coolers, in which he has employed lava for the glaze, instead of the deleterious metallic covering, which is more commonly used for that purpose. Pumice-stone has also, as I understand, been used for covering earthenware, and with very good effect.

Some of the French potters, at the suggestion of Chaptal, have substituted common flint glass for lead, in their glazing, and have found it not only safer, but more economical. They grind broken flint glass to a fine powder, and when this is mixed with a due portion of clay and water, the goods are dipped into it, as our potters dip their ware.

The potters of Bristol, and Lambeth, glaze their stone ware with common salt. When the oven has acquired a certain temperature, the salt is cast in, and the vapours arising from it attach themselves to the goods, and completely cover them. The alkali of the salt probably combines with the silica of the ware, and forms a true glass upon their surfaces.

The English potters are, however, fond of using a glaze made with lead and silica, because, whatever the articles may be which are employed for this purpose, it is necessary to give them a heat sufficient to vitrify the materials, and convert them into a perfect glass: and when the best articles are made use of in forming a glaze, the heat which is employed must be very considerable; whereas, lead alone will readily fuse and form a glaze that may be finished at a very low heat indeed. This, however, if fused alone, would make a glaze too soft, and so extremely fusible, that it would be apt to run very much towards the lower parts of the ware, and leave the upper ones imperfectly covered.

Half a century ago our potters were so careless in their manner of applying the salt glaze to the stone wares of Staffordshire, that large importations were made from France and Holland, where the manufacture was better conducted; and had it not been for Mr. Wedgwood's timely invention of the Queen's ware, it is probable that the best part of the trade would long ago have been lost to this country.

A variety is sometimes given to the glaze, by mixing certain oxides of the metals, especially that of copper, or otherwise, the filings of copper; but this coloured glaze is generally applied only partially, and merely for goods of inferior quality. The edges of common plates are sometimes coloured by this method.*

It is about sixty years since the plain cream-coloured ware of Mr. Wedgwood was introduced. At that time, this unadorned and simple article was thought sufficient for every purpose where porcelain was not employed; and the neatness and cleanliness of its appearance gave it such a decided preference, that her late Majesty allowed the worthy inventor to call it *Queen's ware;* but, when a demand arose

* The beautiful black glaze, which is seen on a peculiar sort of ware made at Nottingham, is composed of 21 parts by weight of white lead, 5 of flints, and 3 of the oxide of manganese. Watson's *Chemical Essays*, vol. ii. page 271.

for more expensive services of pottery, recourse was had to the pencil. From that period, a great number of artists have been constantly employed in painting earthenware, as well as porcelain, and often great taste is displayed in these productions.

It must not, however, be imagined, that painting on earthenware was a new invention. The paintings of the ancients, of this kind, are rare and valuable. The Marquis Marcello Venuti, in his description of the curiosities found in the ancient city of Heraclea, speaks of one upon *slate*, representing a muse crowned with laurel, with a musical instrument hanging on her shoulders, which was found in one of the subterraneous cavities, and is described as being then in the possession of Signor Nicolo Vagnucci, of Cortona, one of the principal supporters of the Academy of Tuscany.*

Nevertheless, it must not be concealed, that Chaptal has shown, that the Romans of the first century were not acquainted with any of the metallic fluxes with which the moderns fix and vitrify the coverings of their pottery. For the particulars, consult his very instructive account of certain colours which were found in the shop of a colour-merchant, in one of the streets of the ancient Pompeia, especially as he has there told us what was the composition of the glaze which the potters of that day did actually employ.†

To return to the consideration of the paintings on English earthenware, it must be observed that the variety of effect is produced by means of the different metallic oxides, each of which affords a different colour, and these colours are again multiplied by such mixtures of two or more of the oxidized metals, as experience has shown to be useful.

In employing these various colours, the ground oxide is first mixed with a prepared flux, which is also reduced to an impalpable powder, and then this mixture is well incorporated with gum water, the acid of tar, oil of turpentine, or some other essential oil, as may be most suitable, in point of expense or otherwise, for the goods on which it is to be employed. The fluids are used merely to lay on the colour; for it is necessary, that, whatever oil be employed, it should have the property of evaporating entirely.

The preparations which are commonly used, are the metallic oxides and their combinations with acids. Thus, cobalt yields a blue; antimony and silver, give yellows and oranges; platinum, a silver colour;‡ gold, violet and purple; copper, the greens; while the reds, the browns, and the blacks, are derived from iron.

The oxide of cobalt employed in the pottery, is usually prepared from zaffre, which is an expensive article imported from Saxony, though a few years ago, very fine oxide of cobalt was procured from Cornwall; for preparing antimonial yellows, the crude antimony is first calcined with four times its weight of nitre, and is then mixed

* Skurray's *Translation*, 8vo. London, 1750, page 107.

† *Annales de Chimie*, tome lxx. p. 22.

‡ Some observations by Klaproth, on the uses of platinum in pottery, may be seen in the *Phil. Mag.* vol. xvii. page 135.

with a certain proportion of vitrified lead. The precipitate of Cassius is the article which is generally used for the production of violets and purples, though sometimes the oxide of gold, precipitated by copper, is employed. For greens, the copper has usually been taken in the state of a precipitate; but some potters have found an article of more value in the pure oxide of copper, which they procure by placing sheets of copper in the ovens in which the ware is glazed; and it has lately been discovered, that a small portion of copper, mixed with the iron, very much increases the intensity of the blacks on earthenware. Besides, iron itself is capable of giving a great variety of colours, according to the way in which it is managed. For instance, the black oxide of this metal, produced by the action of heated air only, will be a very different article, when used as a pigment from an oxide of iron, prepared by other means.

It is here necessary to remark, that in painting on the biscuit, no oil is used; the metallic oxides are mixed with water only; and it is owing to this circumstance, that such ware may be glazed at once, without being put into an oven, as is the case with those goods which are known by the appellation of *blue-printed*.

For certain purposes, however, the painting is performed *upon* the glaze, as some colours would be injured, and others destroyed, by the heat of the gloss-oven. Thus, where iron is employed to produce blacks or browns, the painting is always done *upon* the glaze; the ware is then finished in an enamel-oven, at about 6° of Wedgwood's pyrometer.

Some metallic oxides are used for another intention, besides that of painting, viz. for the purpose of covering the ware entirely on the exterior, as is the case when the sulphuret of antimony is employed for producing a common kind of yellow ware; and also for those articles known by the names of GOLD and SILVER LUSTRE. The first of these lustres is effected by means of gold, the latter by the oxide of platinum. For gilding porcelain, the metal is used in its metallic state. To procure it in a pulverized form, it is dissolved in aqua regia, and then the acid is driven off by heat, and the gold remains: this is then mixed with borax and gum-water, which form together a proper vehicle for fixing it upon the goods. After this it is baked, and finished by burnishing.

For preparing the lustre ware, as it is called, the oxide, of whatever kind it may be, is mixed with some one of the essential oils, and in that state it is brushed upon the surface of the articles. It should have been observed, that when the manufacturer intends to make lustre-ware, the articles are glazed *before* the gold or the platinum is applied. For *gold*-lustre, the ware is made of a red clay, which, when burnt and glazed, shows so much of its colour through the covering of gold, as is sufficient to give the goods that peculiar brown tint, which is always observable on this singular kind of pottery.

When the metallic oxide has been properly applied to the surface of the goods, they are carried to an enamelling-oven, where the heat dissipates the oxygen, and restores these precious metals to their

metallic state,—I cannot say quite to their primitive metallic brilliancy, because this is often much injured by the fluid menstruum employed in the operation. The great difference which there is in the appearance of this ware, especially in that which is covered with platinum, can only be thus accounted for. Some of it looks like silver, while the articles from other manufactories, are more like iron, or steel.

I once imagined that this variation might arise from a different mode of preparing the oxide of platinum. I therefore prepared two samples of this oxide, the one precipitated by caustic ammonia, and the other by muriate of ammonia; but, when I had them tried by an experienced potter, both produced precisely the same colour.

I wish some manufacturer would attempt to produce this ware by mixing the oxide of platinum with pure water only; for in that case, I am persuaded, the ware, when finished, would be as white as the platinum itself.

The potters, of England, have derived great advantage from the introduction of the printing-press. The use of this valuable machine, which is comparatively of late date, has enabled these manufacturers to produce a greater variety of patterns, and of neater execution, than could possibly be acquired, at a small expense, by the pencil.

As this is a curious branch of the business, it will be proper to describe it a little more particularly. It consists in first printing the intended pattern, with some metallic colour, chiefly the oxide of cobalt, on what is called *silver* paper, and then in transferring the colour from the paper to the surface of the porcelain. This style of colouring earthenware, is a very successful imitation of the old blue porcelain of China, and of late years, has been the means of extending the consumption of British pottery throughout Europe, more than any other improvement in the manufactory; for the potters of China are totally unacquainted with the printing-press, and consequently all their designs are produced by the pencil alone.

This mode of imparting designs to the surface of earthenware, or porcelain, and which is known in the trade by the appellation of BLUE PRINTING, is managed somewhat in the following manner.

One man constantly attends the press, which is very similar to our common copper-plate printing-press; and as soon as he has applied the colour, which is laid on the copper in the same manner as the copper-plate printers apply the ink, he lays it upon a hot iron, to thin the oil with which the colour is always mixed for this purpose. The oil which is used, is a peculiar preparation of boiled linseed oil. When the colour upon the copper-plate is thus reduced to a proper consistence, a sheet of silver paper is laid over it, and the workman passes it, with the paper, through the press.

For blue printing, the oxide of cobalt is the only mineral which is employed. This is largely prepared in the Staffordshire potteries, and sells from 40*s.* to 60*s.* the pound, according to its intensity and goodness. Indeed, such improvements have been made in the manufacture of this colour, that the Chinese potters are now supplied from England with all the cobalt they consume.

When the paper comes from the printing-press, it is, of course, found to be stamped with the intended pattern. It is then delivered, while wet with the colour, to a girl, who cuts off the superfluous paper with a pair of scissors, and passes it to another girl, who immediately applies it to a piece of biscuit ware, and then delivers it to a third, who fixes it more firmly by rubbing it very hard with a piece of flannel, tightly rolled up in the form of a short cylinder.

The design of this hard rubbing is to force the colour into the pores of the ware. When the papers, which have been thus applied, have lain on for about an hour, the colour is generally found to be sufficiently fixed to admit of their being detached. This is effected by putting the articles into a tub of water, where the paper soon becomes soft and pulpy enough, to allow of its being peeled off by gentle friction, leaving the full impression of the pattern upon the biscuit.

The papers having been removed, the ware is suffered to stand a sufficient time to become dry, and then it is put into an oven at a low heat, for the purpose of dissipating the oil, and preparing it for receiving the glaze.

It must be obvious that it is necessary to employ a glaze which is transparent, in order to give full effect to the brilliancy of the cobalt colour. A little of this blue oxide is also generally mixed with the glaze, for the same purpose as laundresses employ smalt, with their starch, viz. to increase the whiteness, by subduing any yellow tint, that might otherwise impair its lustre.

Here I cannot avoid observing, that it would be an important acquisition if some suitable article, instead of oil, could be discovered for mixing with the colours which are employed in printing on earthenware, and which could be of such a nature as not to require to be burnt off previously to the application of the glaze. It appears to me to be worth while to institute a series of experiments for this particular object; because, if it could be attained, what immense quantities of printed goods, besides those which are ornamented by the pencil, might be completely finished with two firings, instead of three, which, on the present plan, such goods always require! Were it on no other account than the expense of this vehicle, it is desirable to find a substitute. Some of the first enamel-painters think it necessary to use even the best rectified oil of amber, and this, of late years, has been very costly.

Another idea occurs to me respecting printed ware, which, however fanciful it may now appear, will, I doubt not, some time or other be realized. What I refer to is, the possibility of printing two or three different colours at once, like the Lancashire calico-printers. This, I presume, would be a discovery of great importance to every manufacturer of fine earthenware or porcelain.

A red oxide of iron, more brilliant than any hitherto employed, would be also a valuable acquisition. That which is commonly used, is procured from green vitriol by calcination; but I would suggest that a much finer colour might be prepared from *nitrate* of iron, and advise the potter to take several portions of it, and precipitate the iron by the different alkalies, each in a state of causticity; and by

these means he would readily discover which produced the best, and the brightest, colour. If four distinct precipitates were made, viz. one with lime, another with potash, a third with soda, and a fourth with ammonia, it is probable they would be found to be of very different value, for the purpose of painting on china. The alkaline carbonates would probably give precipitates of inferior qualities; but by a subsequent calcination, the carbonic acid would be separated, and something valuable might be produced.

In making this experiment, it will be necessary to prove all these different oxides on exactly the same kind of porcelain, or the result might be deceptive; for it is well known to practical men, that the oxide of iron will not produce the same fine red upon *common* china, as it will upon the hard porcelain, which is glazed with felspar.

The residuum which is produced by those makers of aqua-fortis who use sulphate of iron, instead of sulphuric acid, might answer a good purpose, if thoroughly freed from the alkaline salt, which it always contains.

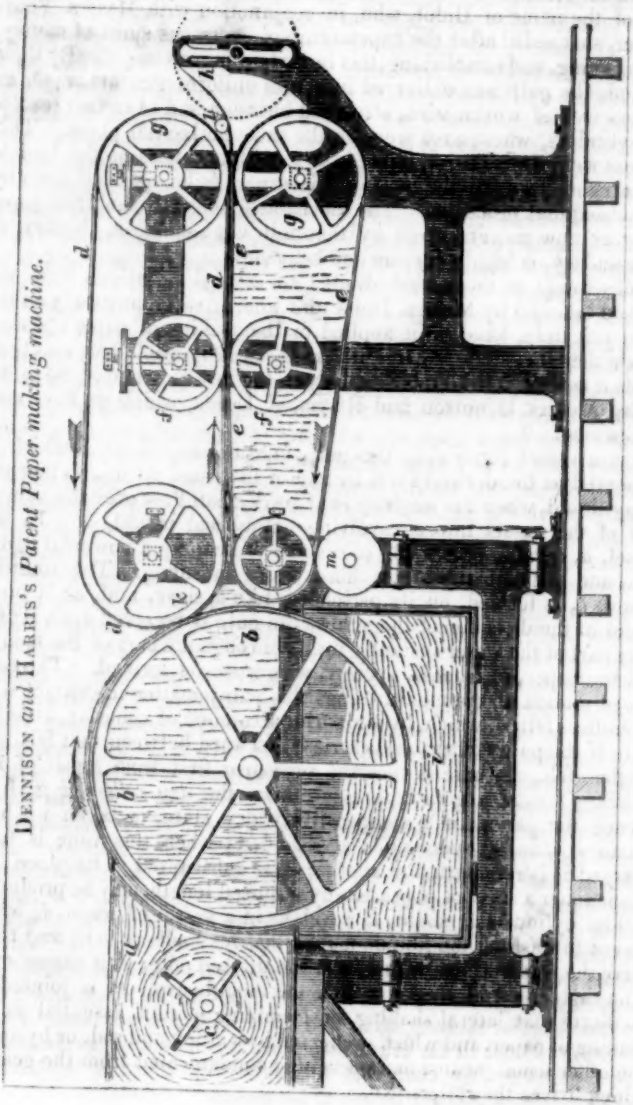
It was my intention to have offered some remarks on the manufacture of crucibles, retorts, and other chemical vessels, which are required to sustain a great heat; but having already extended this essay much beyond its proposed limits, I must content myself with merely referring to those authors, who have already treated on this subject. The most important of these is Pott, who wrote a work expressly upon it, as I have already mentioned.

I shall detain the reader, however, just to notice, that the chief difficulty which the manufacturer finds in preparing such utensils as crucibles, &c. is, that if the portion of silica were employed which is necessary to give sufficient compactness, the ware would, from this very circumstance, be liable to become useless; because many of our chemical articles have the property of dissolving silica. An expedient has therefore been adopted, of mixing a large portion of old pottery with the fresh clay, which gives it the desired weight, and yet is not liable to be dissolved by the alkalies, like pure flint, or sand.

I am moreover desirous of suggesting, whether it might not be adviseable to mix alumina and silica in certain proportions; and, having kneaded this mixture into balls, to burn them in an oven, at the highest temperature the mixture can endure; and whether such a preparation would not be more suitable for grinding with fresh clay, than the old pots, which have hitherto been used for this purpose. I imagine that vessels made in this way, would stand heat and cold better, because the pores of the old stuff are often so close, that it cannot expand and contract by alternations of temperature, as it ought to do. I mean, however, very soon to ascertain this, by some direct and decisive experiments.

I am informed, by a Sheffield manufacturer, that their cast-steel makers mix ground coke with the best Stourbridge clay, and that their crucibles for melting steel, are made with this mixture. Pure earthenware is not fit for crucibles, or for any vessels that must expand, or contract, by change of temperature. This has been long known; Dryden notices it in one of his poems.

ENGLISH PATENTS.



DENNISON *and* HARRIS'S *Patent Paper making machine.*

A description of Dennison *and* Harris's *Patent Paper-making machine.*

The art of making paper, in one continuous sheet of any required length, our readers will recollect originated from an ingenious Frenchman of the name of Didot, who, in conjunction with Messrs. Fourdrinier, succeeded after the expenditure of enormous sums of money, in perfecting, and establishing, this important improvement. By their method, the pulp was delivered in a thin uniform stratum, upon an endless web of woven wire, stretched between and over two revolving cylinders, whose axes were on the same horizontal plane. This endless web of wire work, formed the mould, and became the vehicle for carrying forward the newly-made paper, to be operated upon by the subsequent processes. The mechanism of these machines, especially as now manufactured by that able engineer, Mr. Donkin, of Bermondsey, is highly curious and beautiful.

Subsequent to the period alluded to, several variations from the method adopted by Messrs. Didot and Fourdrinier, but nearly on the same principle, have been applied to the making of paper; among which, that invented by Mr. Dickenson, in 1809, should be mentioned, as it bears a considerable analogy to the newly-patented machinery, by Messrs. Dennison and Harris, of Leeds, which we have now to describe.

a is a vessel containing the pulp, considerably diluted, which is preserved at the desired level by any of the usual means, so that the pulpy liquid, when the machine is at work, shall flow over the curved side of the vessel into a revolving cylindrical mould, *b*. In the vessel, *a*, a vane, *c*, is made to revolve to keep up a powerful agitation, and prevent any of the fibres from subsiding. The rotatory mould, *b*, is formed, on its periphery, like a sieve, and, as it turns round in the direction of the arrow, the pulp is received upon it; the chief part of the water instantly drains through the bars of the mould, and the paper, in a loose, spongy, wet, state, is formed. The continued motion of the mould brings this pulpy matter in contact with an endless felt, *d*, which, by a superior attraction of cohesion, attaches to itself the pulpy fabric, and carries it forward between that felt, and another felt, *e*, where it receives pressure; first from a pair of *wet rollers*, *f f*, then a greater pressure from the *dry rollers*, *g g:* from thence the paper, in a comparatively dry state, is taken up by a rotatory vane, *h*, upon which it is folded; when this vane is fully charged it is removed, and another vane substituted in its place. In this manner a sheet of paper, of any required length, may be produced.

The cylindrical mould, *b*, revolves in a vessel of water, *i*, which serves to wash off the fibrous matter that may adhere to it, and to receive the water which drains from the diluted pulp, as it passes over. The cast-iron frame upon which the mould revolves, is jointed, to facilitate that lateral shaking, or trembling motion, essential in the making of paper, and which is effected by a crank and rod, or by any of the other usual means, motion being communicated from the gearing which drives the rollers, &c.

The roller, *k*, is called the *combing roller*, as it takes the paper off the mould. This roller is provided with a regulating screw to tighten the web,* or adjust the pressure against the mould. The upper *wet roller*, *f*, and the upper *dry roller*, *g*, have, also, regulating screws, by which they may be elevated or depressed in the long slots, wherein their axes revolve, so as to increase or diminish the pressure upon the wet paper. A small roller, *l*, is employed for assisting in separating the paper perfectly, as it passes from the felt on to the vane, *h*. As the lowermost web becomes very wet by receiving the water from the paper, a small cylinder, *m*, is employed to press out the water from it, as it revolves. For the perfect cleansing of the webs from the fibrous matter, small rotatory brushes are directed to be fixed so as to brush over their surfaces; and the employment of jets of water to wash over the felts, is also recommended by the patentees.

In the arrangement of the several parts of this machine, there is some degree of novelty, which the patentees claim as their invention; they also claim the peculiar construction of the rotatory mould. The external outline of this mould, presents, precisely, the figure of a common drum; its periphery is formed by connecting together a series of metallic rings; the cylinder is then covered longitudinally with numerous small thin bars of copper, $\frac{3}{4}$ of an inch wide, placed edgeways, so as to present a complete grating over the whole surface. The copper bars have numerous small lateral projections, to keep them at a regular distance apart: these are directed to be made by passing plain slips of copper between cylindrical steel rollers, with indentations on one of them adapted for producing a uniform series of little stubs. [*Register of the Arts.*

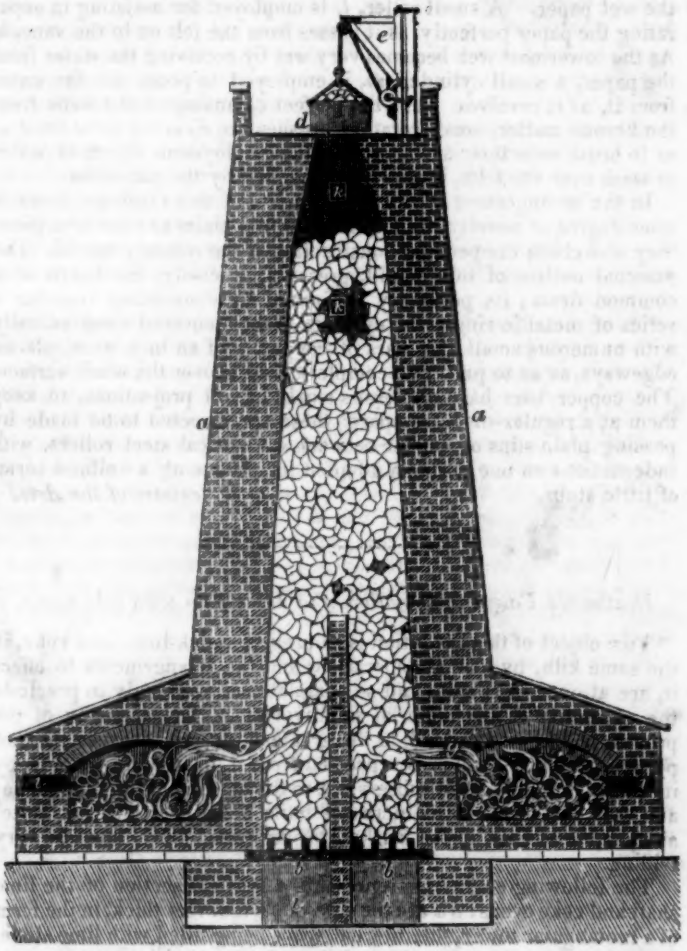
Heathorn's Patent combination of a Lime Kiln with coke ovens.

The object of this invention is to prepare quick-lime, and coke, in the same kiln, by a single operation; and the arrangements to effect it, are at once so simple, and so complete, as seemingly to preclude the capability of any material improvement. The economy of the process is likewise carried to the greatest possible degree; for that portion of the coal which is separated from it, in forming coke, is, by its combustion, rendered subservient to the burning of the lime stone; and the coke, owing to its increased bulk, being nearly (if not quite) as valuable as coal, in the market, the expense, if any, must be very trifling.

The following engraving represents a vertical section of the lime shaft and coke ovens: *a a* are the side walls, four feet thick, in the form of a rectangular tower, the internal space being filled with lime stone, from the top, to the iron bars, *b b*, at bottom, whereon the whole column rests. The lime stone is raised in a box *d*, or other proper receptacle, to the top of the building, by means of a jib and crane *e*,

* For this purpose the screw appears to be put upon the wrong pulley.

or other tackle, which is fixed at the back of the tower, together with a platform, projecting beyond the walls for affording security, and convenience for "landing" the lime stone: when raised as represented, the jib is swung round, and the lime box tilted, by which the whole contents are thrown down the shaft.



The coke ovens, of which there may be two, or a greater or lesser number, according to the magnitude of the works, are constructed and arranged, in connexion with the lime shaft, in the same manner as the two represented in the diagram at *f f*. These ovens are sup-

plied with coal through iron doors in the front wall, (not seen in the section;) the doors have a long and narrow horizontal opening in the upper part of them, to admit sufficient atmospheric air to cause the combustion of the bituminous or inflammable part of the coal; the flames, proceeding from thence, pass into the lime shaft, through a series of lateral flues, (two of which are brought into view at *g g*;) and the draft is prevented from deranging the process in the opposite oven, by the interposition of the partition wall, *h*, which directs the course of the heat and flames, throughout the whole mass of the lime; the lowermost and principal portion of which, attains a white heat, the upper a red heat, and the intervening portions, the intermediate gradations of temperature.

When the kiln is completely charged with lime, the openings in front and beneath the iron bars, at *i i*, are closed and barricaded by bricks, and an iron-cased door which is internally filled with sand, to effectually exclude the air, and prevent the loss of heat by radiation. Therefore, when the kiln is at work, no atmospheric air is admitted but through the narrow apertures before-mentioned in the coke oven doors.

When the calcination of the lime is completed, the barricades at *i i* are removed, the iron bars at *b b* are drawn out, by which the lime falls down and is taken out by barrows. It sometimes happens, however, that the lime does not readily fall, having caked or arched itself over the area which incloses it, in which case a hooked iron rod is employed to bring it down. To facilitate this operation in every part of the shaft, where it may be necessary, a series of five or six apertures, closed by iron doors, are made at convenient distances from the top to near the bottom of the shaft; two of these are brought into view at *k k*, where their utility is made apparent in the diagram. Two similar apertures are shown in section in the coke ovens at *l l*, which are for the convenience of stoking, or clearing out, the lateral flues, *g g*, from any matter that might obstruct the free passage of the flames and heated air.

When the coals have been reduced to coke, the oven doors in front (not shown) are opened, and the coke taken out by a peel iron, the long handle of which is supported upon a swinging jib, that acts as a moveable fulcrum to the lever or handle of the peel, and thus much facilitates the labour of taking out the contents of the oven.

The other arrangements of the patentee for conducting the business of lime and coke works, economically, on the large scale, are worthy of the particular notice of persons engaged in that department of our manufactures; but our limits prevent us from going into their detail. There are, however, some points of importance, as respects the latter class of persons, which we ought not to omit, and as these are stated in a letter received from the patentee (which brought the subject under our notice, and induced us to examine the enrolled specification) we here subjoin it.

Maidstone, 4th Dec. 1826.

Sir,—I beg to introduce to your notice a sketch of a lime-kiln, wherein the whole of the fuel employed, is saved, by its being converted into coke.

After a number of experiments on various kilns constructed on different plans, and conducted under my own immediate inspection, for upwards of ten years past, this kiln has been completed; and (with the advantage of saving the whole of the fuel,) possesses a facility of drawing the lime, equal to a common tunnel kiln. The gradual manner, also, in which it causes the chalk or stone to be burnt into lime, is such as to leave no refuse whatever, and consequently, the usual operation of sifting the lime is unnecessary.

This kiln is now, and has been for some time past, in full operation, and may be inspected at the Lime Works of the patentee, Mr. Charles Heathorn, Maidstone.

I am, sir, very respectfully, yours,

CHARLES HEATHORN.

[*Register of Arts.*

Description of Dunn's Patent Screw Press.

THIS is a convenient modification of the Screw Press, for the pressing of paper, books, tobacco, cloth, &c. and for expressing of oil, extracts, tinctures, &c.

Instead of the simple lever, consisting of a long straight bar, which requires so large a space to move it in, the patentee uses a compound lever, (much like those employed in the ordinary printing press,) by which means the same power is obtained in a much more compact apparatus.

Fig. 2.

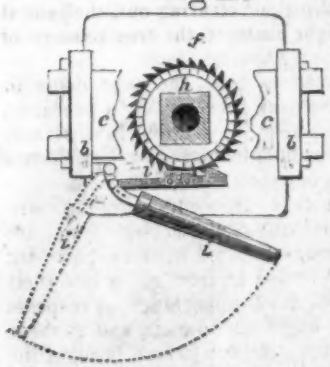


Fig. 1

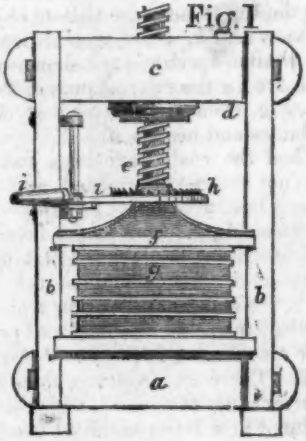


Fig. 1 represents an elevation of the complete press, and Fig. 2 a plan of the improved part of the machine; the like letters in each figure denoting similar parts.

a is the bed of the press, of massive oak; *b b* the cheeks, or side framing; *c* the head; *d* the nut, fixed into the head, through which

the screw, *e*, is turned; *f* is the platten; *g* the goods, together with the press boards, or metal plates between them. Thus far the press is like others; but instead of having a large screw-head, with apertures for the insertion of a long lever bar, that part of the screw is squared, and on it is fixed a circular metallic plate, or wheel, *h*, with a double row of ratchet teeth; one of the rows of teeth project horizontally from the periphery, the other vertically; as will be understood, upon examining both figures. *i* is the handle of the compound lever, which being formed into a circular eye at the farthest extremity, is thereby fixed upon, and traverses up and down the fulcrum, *k*, which is an upright bar, firmly bolted to one of the cheeks of the press. To alter the power according to circumstances, the curved end of the handle, *i*, is perforated with several holes, to receive a key, or bolt, which fastens the other portion, *l*, of the compound lever to it, (best seen in Fig. 2;) the extremity of *l* is hooked or notched, so as to take hold of the teeth of the ratchet wheel, and it has a plate screwed on to it at *o*, to prevent it from falling off. To support the compound lever at the required elevation, a stout pin is passed into a hole, of which there is a series made for the purpose, in the side cheek.

In operating with this press, the goods are laid upon the bottom board in the usual manner, the platten *f* is then brought down by turning the ratchet wheel round by hand. The pressure is then given by pulling back the handle *i* in the direction, and to the position, shown by dotted lines in Fig. 2; by repeatedly moving the handle in this way, the ratchet wheel is drawn round by the lever, which causes the screw to descend, and to force the platten against the goods; during this operation, it will occasionally be necessary to let the lever descend upon the fulcrum, by taking out the supporting pin, and putting it into the next hole beneath.

When it is required to unscrew the press, the hooked end of the lever *l* is placed in contact with the circle of teeth on the upper surface of the ratchet wheel; the lever being then pulled the reverse way, the screw is raised, and the pressure taken off.

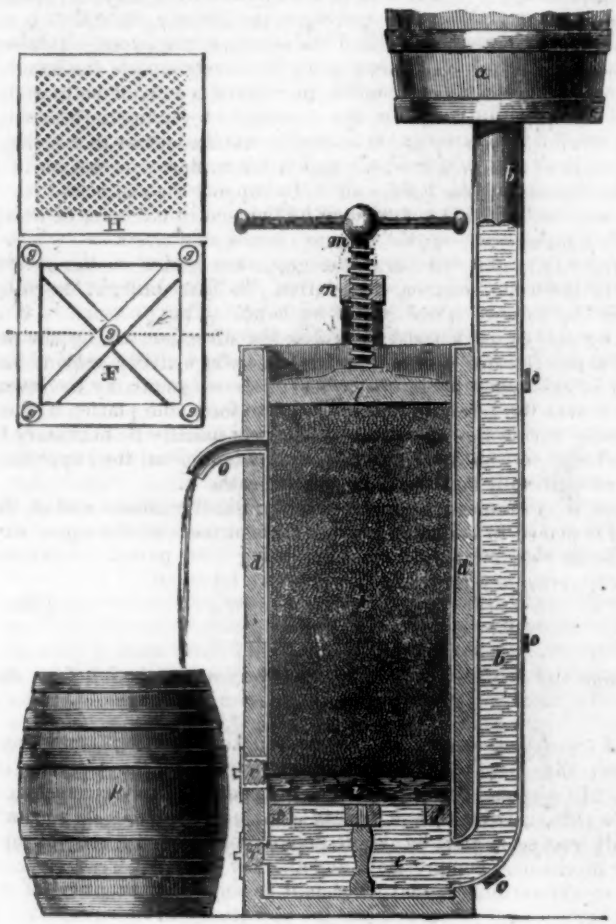
[*Ib.*

Williams and Doyle's patent apparatus for separating Salt from Sea Water, and rendering it fresh.

The patentees of this invention are Mr. John Williams, ironmonger, and Mr. John Doyle, merchant, both of the Commercial Road, Middlesex; and if the statements contained in their specification be true, it is really one of very great importance. To separate the salt from sea-water, by simple percolation through a body of sand under mechanical compression, and thereby render it fresh, appears to us so extraordinary, that we should be somewhat sceptical of the fact,* were we not persuaded that the patentees must have repeatedly

* May not some of the fresh water springs which are found near the shores of the sea, derive their source from the ocean, the salt being deposited as the waters rise through the superincumbent earth?

proved it to be the case, before incurring the expense of a patent-right. We have had no communication with either of the patentees on the subject, (having merely read the specification at the patent office, where it has just been enrolled;) but should either of those gentlemen favour us with the details of their experiments with the apparatus, we are sure they would be read with much gratification, and, probably, be conducive to their advantage, from the great circulation of our work among the shipping interest.



The preceding engraving, though it does not embrace all the drawings attached to the specification, sufficiently illustrates the process, and one of the modifications of its construction.

a is part of a cask, supposed to contain sea water; *b* a tube descending therefrom, made fast by bands, *c c c*, to the filtering apparatus, *d d*, which is a strong square trunk of wood, lined internally with sheet lead, which is cemented to it, that the water may find no passage between: this part of the apparatus is given in section, that the construction and arrangement may be seen in one view. *e* lower chamber, where the water is first received; *f* a strong stool of open frame work, supported upon five stout legs *g*. (A plan of this stool is given in a separate figure F, the situation of each of the five legs being marked with a *g*.) Over this stool frame is nailed a plate of copper, pierced with numerous small holes: this plate of copper is also shown by a separate figure H. Over the perforated copper plate are several layers of woollen cloth, or woven horse hair, *i*, and above these, a body of sand *k*, filling up the entire trunk: on the top is placed a sliding cover *l*, which is operated upon by a strong screw *m*, working through a fixed nut *n*, which is supported by curved iron arms extending from the opposite sides of the trunk.

The sand having been compressed by the agency of the screw, into a more dense and compact mass, is prevented from rising by the pressure of the water, which, percolating through the minute interstices to regain its level, deposits its salt, and runs out of the pipe *o* in a fresh state, into a vessel *p* placed to receive it.

When the sand has become saturated with salt, it is to be removed by taking out the screw and the pressing board *l*. The main holes *r r* may then be opened, by unscrewing the plugs, when the other materials may be easily shifted. These matters being completed, a fresh quantity of sand may be taken from the ballast of the ship, and the process of filtration be repeated as before. The sand that has been saturated with salt in this manner, serves still *as ballast*, and, on the arrival of the ship in port, and the discharge of her ballast, it is considered that *the salinous sand will form an excellent compost for manuring land.* [*Ib.*

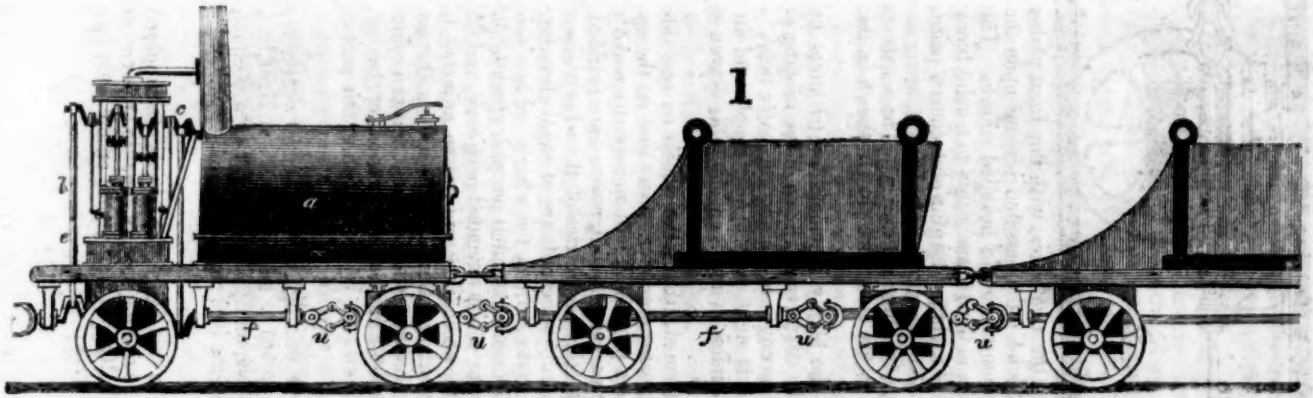
Remarks by the Editor.—A simple and easy process for separating the salt from sea water, so as to render the water fit for ordinary use, is 'a consummation devoutly to be wished;' but we must unlearn all our chemistry, and admit that 'chaos has come again,' before we believe that Messrs. Williams and Doyle have *sifted* the water from the salt. If they have 'repeatedly proved it,' they must have proceeded in a manner similar to a wiseacre of our own country, who obtained a patent for the same thing, after having proved it, once at least; but he at length discovered, that the fresh water which he obtained, was that portion which he had poured in to moisten his sand, before attempting to filter his salt water, and which the latter forced out.

James's Patented improvements in Rail-ways and Locomotive Carriages.

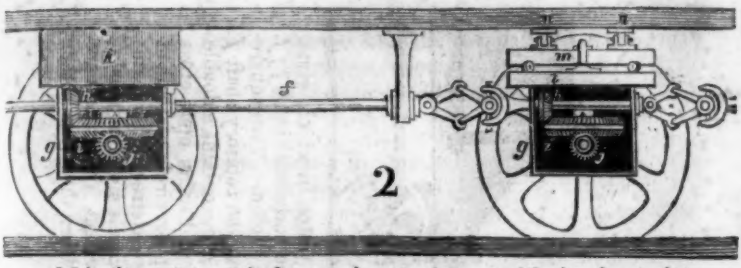
It has, we believe, been a generally received opinion, that carriages on a rail-way cannot be propelled by locomotive power up an inclined plane that rises more than twenty feet in a mile, without the assistance of indented or toothed rails to increase the resistance, and thus prevent the carriages from slipping back. By Mr. James's new improvements, this difficulty is, however, so completely overcome, that a train of carriages may now be made by a locomotive engine to ascend and descend inclined planes of any elevation necessary in the construction of rail roads, and over very smooth and almost polished surfaces. We understand that the most satisfactory proofs have been afforded of the ability to effect this, by repeated trials on a rail road more than a hundred feet in length, laid down for the purpose of experiment; on which it was found that a train of carriages would (with the patentee's improved machinery) ascend inclined planes of 3 inches in the yard, which is equal to 440 feet in the mile. This important advantage is gained by applying the power to the axle-trees of the wheels of the several carriages in the train, by means of the rotation of a long horizontal rod (or series of connected rods) actuated by bevel gears under each carriage.

The other improvements are for enabling the carriages on a rail-way to pass around turns or curves in the road without additional friction. For this purpose, the horizontal rotatory shafts, which cause each pair of wheels in the train to revolve and propel the carriages forward, are connected together by a novel and very ingenious kind of universal joint, which communicates the rotatory motion to each successive carriage, even if so placed on the curves of the roads that the sides of one carriage shall present to the side of the next an angle of 30 degrees. To cause the carriage wheels to run round the curves of the rail-way without the usual destructive rubbing of their surfaces, the rails in those parts are made with several ribs or elevations, and the wheels of the carriages are consequently formed to correspond with those ribs, by their peripheries being grooved in like manner; so that a wheel, in effect, possesses as many diameters as there are variations in the surface of its periphery, by which means, it may be made to travel faster or slower, as may be desired.

That these consequences result from Mr. James's improvements, will be readily seen on reference to the engravings, which we shall here introduce.



a is the boiler of a steam engine, *b* the engine with two cylinders, the alternating motion of the piston in which, gives rotation to the crank *c* above; the rods *e e*, attached to the same, being also fixed to the crank of the horizontal shaft *f f f* (which passes under the carriages,) cause that to revolve with a similar speed to the crank of the engine. Two square boxes, *g g*, are fixed under each carriage; through these, the axletrees of each pair of wheels, pass; the rotatory shaft *f* passes also through the boxes above the axletrees, and at right angles with them; each of the boxes, *g g*, contains a double bevelled horizontal wheel, which presents a circle of cogs in its upper as well as its lower side, and turns upon cross bearings; now the shaft *f*, carrying upon it a vertical bevelled pinion in each box, takes into the upper circle of teeth of the horizontal wheel, while the under circle of teeth of the same, actuate a bevelled pinion on the axletree underneath; consequently, compels the wheels to revolve; and the power being thus applied to every pair of wheels simultaneously, sufficient resistance is obtained, on a smooth surface, to ascend inclined planes of considerable elevation. *u u u u u* are the universal joints, which communicate rotatory motion, when the carriages are not in a straight line: these, and other moving parts, are distinctly shown in the annexed figure, which is upon a larger scale.



f f is the rotatory shaft; *g g* the two boxes, with the front plates removed to show the gear inside; *h h* the bevelled pinions upon the shaft in each box; *i i* the horizontal double bevelled wheels. The front box, *g*, under the carriage, is fixed immoveably to a solid block of wood; the other box is fixed to a plate *l*, turning on a central point, which passes through another plate, *m*, above; the plate, *m*, being secured to the floor of the carriage by hinge joints, *n n*. The construction of the universal joints, *u u*, are also more clearly shown in this figure.

We have now to describe the highly ingenious contrivances by which the patentee obviates the destructive effects of the rubbing or sliding of the inner wheels of carriages in making curves or turns in a road; contrivances that, at first sight, may appear simple and unimportant, but which, in our opinion, evince a considerable degree of skill in the inventor.

Our readers need not be informed, that if the wheels on one side of a carriage be larger, or of greater diameter, than those on the opposite side, such carriage, when propelled, will necessarily make a curve. On this principle the patentee's contrivances are founded. In running along a straight line the peripheries of the wheels are of equal diameter, and the bearing upon the rails are of equal elevation; but when the carriage has to make a turn, the wheels on one side roll upon a greater diameter, or more extended periphery; while the wheels on the opposite side run on a less extended periphery, and the elevations upon the rails upon which they run are so adjusted to these variations, that the different peripheries of the wheels change, and come in contact with the variable parts of the rail, and run round the curves, without any perceptible increase of friction, or jarring, or jolting. The annexed diagrams are in illustration of this part of the patentee's improvements.

In this figure, the carriage wheels are supposed to be running in a straight line, consequently the peripheries are equal, and the bearings of the rail equal.

In this figure, the wheels are supposed to be making a curve equal to an increase of half an inch in a yard on the outer line or track.

In this, the wheels and other parts are adapted to make a turn, where the curve makes a difference in the two lines of two-thirds of an inch in the yard.

In this, a curve wherein the difference is one inch.

It is calculated that the following advantages will result from these improvements, viz.

A saving will be effected in the principal part of the cuttings, embankments, viaducts, &c. and a saving of full four-fifths of the time requisite for making the road. A saving in the land lost in deep cutting, and forming the slopes of the embankments; and in shortening the distance, in consequence of the engine and loaded carriages being able to pass over elevated ground; and owing to the resistance at each individual carriage, the engine carriage may be reduced full one-third in weight, therefore a greater load may be propelled by the same power. There will be a saving in the primary and current expenses of fixed engines, wherein the power applied is always the same, whether the traffic upon the road requires it or not, and in avoiding the delay consequent upon their employment; whereas, in locomotive engines the power may always be adapted to the trade, or load. An opportunity will be afforded of passing over, or under, turnpike roads, &c. by which much of the objection raised against rail-ways in populous districts is obviated; and the obstacles presented by private property may generally be avoided. In enabling the engine and train of carriages to be suddenly stopped, whether on level ground, or in descending hills, and also in reducing the liability to breakage, or accident, in stopping such carriages, in consequence of the number of parts to resist a sudden impulse, much will be saved.

Rail-roads of the usual construction soon get out of order by wearing at the turns, and in the settling of the ground in new embankments, which will be wholly prevented by the present improvements. There being no deep cuttings and embankments, property in land will not be divided by them, as in ordinary cases. By means of the joints (before mentioned) under each of the carriages, a nearly equal bearing of each wheel is effected, if the surface of the rails should be uneven; so as to cause the axles to stand at different angles. A considerable saving, it is considered, will likewise be made in the tonnage and interest of the capital expended, and in completing the rail in much less time than usual; also in the facility, and little expense, attending the making alterations in the rail after completion.

[*Ib.*

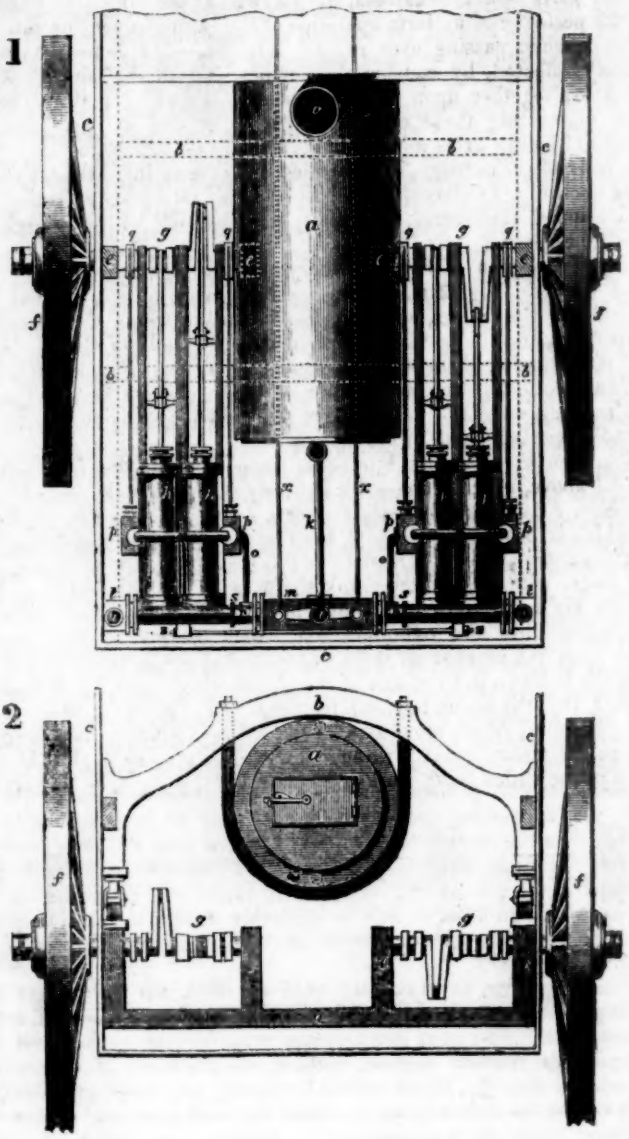
Account of W. H. James's Patent Steam Carriage.

INSTEAD of actuating the several wheels of a carriage with a single engine, as heretofore, Mr. James adapts separate engines to each wheel. These engines are of small and equal dimensions, and have their steam supplied by pipes connected with the boiler, situated in a convenient part of the carriage. The object of the patentee, in employing separate engines, is, that each wheel may have a motion independent of any of the other wheels, so that their powers or velocities may be varied at pleasure, which is essential in passing round curves, or turning corners of the road; because, (as is well understood) when a carriage moves in the arc of a circle, the outer wheel passes over a greater distance of ground than the inner wheel —consequently rendering it necessary that the engine connected with the outer wheel, should be made to work so much faster than the engine connected with the inner wheel: this Mr. James effects most completely by a very charming and exceedingly simple contrivance, —he causes the fore axletree to be connected with a stop-cock placed in the main pipe, through which the steam passes from the boiler to the respective engines; this stop-cock is so constructed, that when the fore axletree stands at right angles to the perch, (i. e. when the carriage is proceeding in a straight line) it admits *equal quantities* of steam to each engine; but whenever the axletree stands obliquely to the perch, (as in making curves in the road) it causes the stop-cock to admit *a greater quantity* of steam to the engine connected with the outer wheel, so as to cause that wheel to revolve faster, and *a diminished quantity* to the engine connected with the inner wheel, so as to make it revolve slower, *in exact proportion* to the curve around which the carriage is moving.

Upon roads of moderate elevation, Mr. James applies separate engines to each of the hind-wheels only; but upon roads that have greater ascents, he employs four engines, that is, one to each wheel, and thus he obtains a greater degree of resistance or friction upon the surface passed over. In ordinary roads, however, Mr. James considers that two engines will be amply sufficient, because it is not required, *on this principle*, that the wheels shall be thrown out of gear, and in passing round curves they may be kept contantly in action; thus the amount of friction against the road will be preserved tolerably uniform, which is, of course, very important in propelling a carriage in the precise line required: if, under any circumstance, as in passing down hills, it may be advisable to lock one of the hind-wheels, it may be effected, as in other carriages, by putting on a drag.

From what we have already said, we think the advantages resulting from the employment of a separate engine to each wheel, must be apparent. The next desideratum was, to give each wheel an independent rotatory motion, without the necessity of employing *fly-wheels;* this Mr. James effects by having two small cylinders to each engine (as shown in fig. 1, which we shall presently describe.) Without such an arrangement, in passing over rough or loose

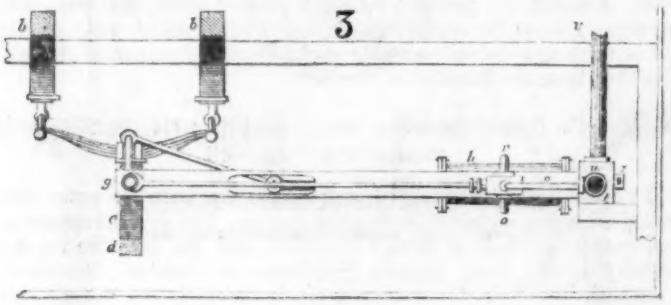
ground, or in the ascending of steep hills, the impulse given to the carriage would not be sufficient to carry the engines over their centres.



The next object, which has hitherto been considered as one of almost insurmountable difficulty—that of putting the whole of the machinery upon springs, so as to prevent any injurious effect to the acting parts from concussions, and likewise at the same time to allow of the perfect and uniform operation of the engines upon the running wheels, when passing over rugged surfaces,—Mr. James has completely effected, by causing the engines, and their frame-work, to vibrate altogether upon the crank-shafts, as a centre; at the same time connecting these engines *to the boiler and exit passages*, by means of hollow axles moving in stuffing boxes, which, together with the body of the carriage, is suspended upon the springs; these springs rest upon the axletrees, as will be understood by an attentive examination of the figures, (especially fig. 3) which we shall now proceed to explain.

Fig. 1 is a plan of the machinery of a carriage as applied to the hind wheels. Fig. 2 is a cross section, giving an end view of the boiler and the cranks, showing the manner in which the former is suspended, and its mode of attachment to the body of the carriage, and the situation of the springs on which it rests. Fig. 3 is a longitudinal section, giving a side view of the machinery as attached to the running wheels; similar letters of reference apply to the corresponding parts in each of the figures.

Fig. 1, *a a* represents the boiler suspended to the frame-work *b b b b* above, which frame-work is firmly attached to the body of the carriage, *c c c c*, and form its support; *d d* is the axle-tree, the form of which is best seen in fig. 2, has four supports, *e e e e;* the axles of the running wheels, *f f*, are fixed thereto, and are connected in one piece, with each of the crank shafts, *g g;* by which each of the wheels are made to revolve independently of each other. Each of the engines has two cylinders, *h h*, which operate by their piston rods upon the cranks: to these separate engines, steam is supplied from the boiler, *a a*, by means of the pipe *k*, which enters at the stop-cock, *l*, into the steam box, *m;* from this box, the steam passes into the pipes, *n n*, which move steam-tight through stuffing boxes; from thence, the steam proceeds through the pipes, *o o o*, to the slide boxes, *p p p p*, the slides being worked by eccentrics, *q q q q*, on the crank



shafts in the usual manner, and from thence to the cylinders. The exhaustion pipes, *r r*, lead into the hollow axles, *n n*, before described, in which there are partitions, *s s*, to separate the steam from the exit passages, which pass through the said hollow axles to the boxes, *t t*, from which there are pipes, *u u*, leading into the chimney, *v*, shown in section. The rods, *x x*, are attached to the fore axle of the running wheels, and also to the two handles of the cock, *l*, so that the fore axle and the cock move simultaneously and parallel to each other. *z z* represents part of the frame work extended for tying the engines together by means of a connecting bolt; and so as to allow the body of the carriage to have a slight lateral motion upon its springs, independent of the engines, by means of the hollow axles sliding longitudinally through the stuffing-boxes.

In the preceding account we have given the substance of Mr. James's specification; and although it contains much novel and valuable matter, he limits his claim of patent right to the following points only, which we add verbatim:—

"I have herein described, for the perfect understanding of my invention, the general construction and operation of a steam carriage to be actuated upon my improved principles; but I do not mean to confine myself to this particular construction or adaptation of parts, *as my invention consists simply and exclusively in adapting distinct steam engines to the several wheels upon which the carriage runs, for the purpose of actuating such several wheels independent of each other, whatever may be the number of wheels so employed, or whatever may be the construction or position of the steam engines and their appendages so adapted, or whatever may be the form of the carriage to be propelled.*"

ENGLISH PATENTS FOR DISTILLING.

Among the subjects which have, of late years, received particular attention in England, that of improvements in the apparatus for distilling, holds a conspicuous place. We have obtained cuts of several of these, a part of which we insert in the present number, and shall give the remainder in our next. Our readers will not wish the whole detail of the patents; we shall present them, therefore, with the description of the engravings, with such other matter, only, as may aid in forming a correct estimate of the various plans; these descriptions are from the Register of the Arts.

Saintmarc's Patent Apparatus and Process for the Distillation of Brandy from Potatoes.

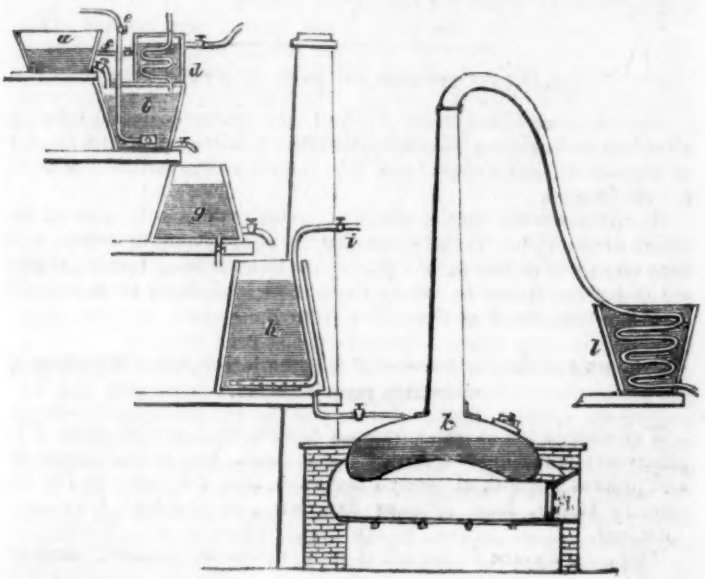
The distillation of alcohol from potatoes has been for some time practised on the continent, with great success. The present apparatus and process are both of foreign invention, and the patentee for this country is Mr. Jean Jacques Saintmarc, of Belmont Distillery, Vauxhall.

The potatoes are first washed in the common machine used for that purpose, which consists of a hollow cylinder, the periphery of it

being formed by open rails placed a little distance apart from each other; the cylinder is immersed in a vessel of water, and a rotatory motion being given to it, the dirt is quickly removed.

When the potatoes have been thus thoroughly cleansed from the earth which adheres to them, they are taken to the mill and ground into pulp; the pulp is first mixed with a large quantity of water, which takes up the chief part of the contaminating brown colouring matter, and it is then poured through a coarse sieve, which, detaining those pieces of potatoes that have escaped the mill without being ground into pulp, they are rejected as ineligible for fermentation, and applied to the feeding of pigs. The pulpy liquid, thus freed from the coarser pieces, runs into a trough containing a number of small holes, and lined, in the inside, with a linen cloth, sufficiently fine to prevent the floating particles of starch from passing through; the water then drains through the linen, leaving the pulp and starch to settle in a mass. When it has sufficiently drained, and become solid and compact, it is removed from thence and laid upon a plastered floor, which rapidly absorbs a great portion of its moisture. To dry it entirely, it is afterwards placed in a kiln or stove, which completes that part of the process. In the dry state, the pulp may be kept uninjured for years, and may, therefore, be stored away for future use. The wet pulp being, however, equally serviceable for immediate fermentation, there is no occasion to dry it, if the several processes in distillation, can be carried forward at the time.

Supposing the pulp to be used in the dry state, it is cut or broken to pieces, and mixed in the vat, *a*, with sufficient hot water to bring it to the consistence of cream. The vessel, *b*, lined with lead, called



the *decomposing vessel*, is then to be supplied with water about six inches in depth; to this a quantity of sulphuric acid is to be added in the proportion of three pounds of acid, to every hundred pounds of *dry* pulp, but only two pounds of the acid to every hundred pounds of the *wet* pulp.

The diluted pulp in the vessel *a* is then to be discharged, through the cock, into *b*, containing the diluted acid; further quantities of pulp and acid may in like manner be prepared until the decomposing vessel is sufficiently filled. Steam is then to be admitted from a boiler (not shown in the engraving) by turning the cock in the pipe *e*, which descends to the bottom of the vessel, where it is made to issue from a steam box; the heat causes the mixture to boil, and after four or five hours ebullition, the decomposition is considered complete. Before, however, describing the next part of the process, we should notice that a worm-tub *d*, supplied with water from the service pipe, is placed on the top of the decomposing vessel; the vapours from the boiling liquor beneath, enter this worm, and are therein condensed by transmitting their caloric to the surrounding water; and the water thus made hot, serves for replenishing the vat *a* with fresh portions, from time to time as it may be required, by means of a connecting tube *f* furnished with a stop-cock.

The contents of vessel *b*, after decomposition, are discharged into the *saturating vessel*, *g*, and during the time that is running, a quantity of lime or chalk, in solution, may be poured amongst it, as long as any effervescence continues, which will vary according to the degree of concentration of the acid; but in general three pounds of chalk or lime will be found sufficient to saturate each pound of sulphuric acid employed in the preceding part of the process.

The liquid in the saturating vessel having now become transparent, it is to be drawn off into the *fermenting vat*, *h*, placed beneath, leaving the precipitated sediment undisturbed at the bottom whilst the clear liquor is running. The discharge cock being closed, the sediment may be stirred up with a quantity of water, to take up whatever saccharine, or fermentable matter it may contain; this should be allowed to settle again, and then added to the former liquor in the vat beneath.

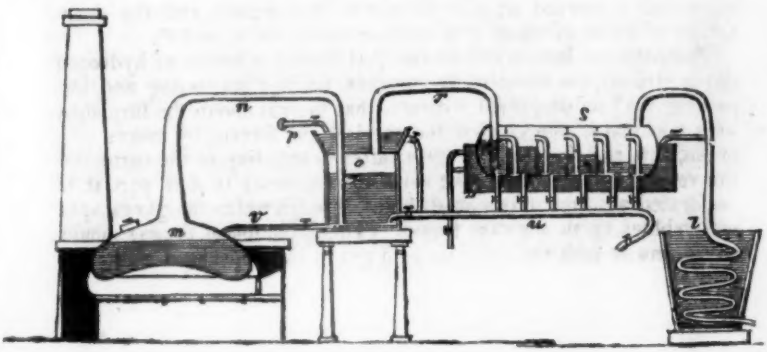
To promote the fermentation, a quantity of yest is now to be added to the liquid, in the proportion of three pounds to every hundred pounds of potato pulp. During the fermentation, which usually occupies from fifteen to twenty days, the temperature of the liquid should be preserved at from 90 to 100° Fahrenheit, and the atmosphere of the room where it is conducted, at from 80 to 85°.

The patentee having discovered that the introduction of hydrogen gas facilitates the fermentative process, besides increasing and improving the product, further directs that the vat should be furnished with the tube *i*, along which the gas is to be forced, by means of a pump, into the liquid. The tube, after descending to the bottom of the vessel, takes a horizontal, serpentine course; in this part it is perforated with numerous small holes, through which the gas escapes and bubbles up through the liquid. This injection of the gas should be continued until the carbonic acid gas in the upper part of the vat

contains an excess of the hydrogen. The patentee is of opinion that the introduction of hydrogen gas may be very advantageously used, not only in this process, but in the fermentation of all matters from which spirit, or alcohol, is to be extracted.

When the vinous fermentation has ceased, the liquor is to be drawn off through the tube into the still *k*, which is shown in section, built over the furnace. This still is of the ordinary construction, except that instead of having a large head or capital, it has a long neck rising perpendicularly from the body, the object of which is, that the aqueous part of the vapours may be condensed before entering the inclined part, and fall back into the still; while the more volatile, or spirituous, pass on alone into the bent arm, and from thence into the refrigeratory, or worm-tub, *l*, where it is converted into the ordinary first product of distillation, called *low-wines* (which is a very weak spirit.) The low-wines are then taken to another apparatus, which the patentee calls his *low-wine still*, to undergo a fresh distillation.

The *low-wine still*, and its several parts, are very judiciously adapted for conducting the subsequent process with great despatch and convenience. *m* is the body of the still fixed in brick-work over a furnace; a long perpendicular neck proceeds from this as in the former instance, the object of which is, that the aqueous part of the vapour may be condensed as it ascends and fall back again, while the more volatile and spirituous, passes on through the tube *n*, to the bottom of the vessel *o*. This last mentioned vessel has a tub of cold water placed on the top of it, which is kept supplied by the service pipe *p*; and as tube *n* passes through this tub, the greater part of the vapour in the tube *at first* condenses, and is received into the vessel *o*, in a liquid form; but as the vapour is continually coming over from the still, the condensed liquid is at length made to boil: the vapour filling the upper part of the vessel, from thence passes up the tube *r*, into the long cylindrical vessel *s*, which is partly immersed in a large cistern constantly supplied with cold water by the usual means. The cylindrical vessel *s*, is divided by five vertical partitions into six compartments, but having a communication from one to the other, by means of bent tubes, proceeding from the upper part of the first compartment, to the lower part of the second; and in the same manner from the second to the third, the third to the fourth, and so on.



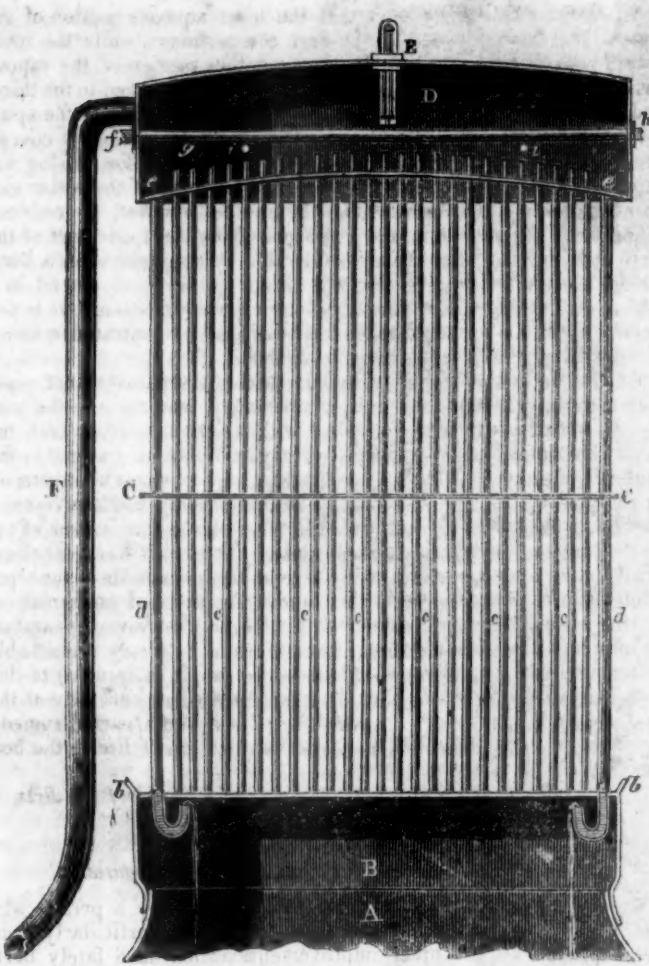
It will now be readily seen that the most aqueous portion of the vapour will be condensed in the first compartment, while the more volatile passes into the second, where another portion of the vapour assumes a liquid form; the more volatile, will still proceed to the third, and from thence to the fourth, fifth, and sixth, according as the spirit is more or less divested of aqueous particles; all depending, of course, upon the degree of heat employed in the furnace for raising the vapour in the still *m*, and to the degree of coldness of the water surrounding the condensing vessels. To ensure, however, the condensation of all the vapour, a tube *g* proceeds from the upper part of the sixth compartment, rises to a considerable height, then takes a horizontal course, and finally descends into a spiral worm placed in a tub of cold water, where, making a long circuitous passage, it is delivered from the bottom into a receiver, in so concentrated a form, as to be nearly in the state of pure alcohol.

At the bottom of the cylindrical vessel *s*, a separate short pipe, with a cock, proceeds from each compartment leading into the long pipe *u*, which being also furnished with a cock at either end, the spirit contained in any compartment may be drawn off distinctly; the contents of any, or all the compartments, may likewise be drawn off by the pipe *u*, into the vessel *o*, for re-distillation; and the vessel *o* may be discharged back into the still, when desired, by means of the pipe *v*, having a cock for that purpose. Thus this very excellent arrangement and connexion of the several vessels, admits of the repetition of the processes with the utmost facility and convenience. Having said thus much in favour of this cleverly contrived apparatus, we may be allowed to mention what strikes us as a very remarkable defect, viz. the employment of *naked* fire (as it is termed) to this still, instead of the water bath, and the consequent necessity of the long perpendicular head to it, which is, at best, but a partial remedy for the evils engendered by the direct application of fire to the bottom of the still.

[*Register of the Arts.*

Description of Grimble's Patent Distilling Apparatus.

GRIMBLE'S patent distilling apparatus is said, by a person who had carefully examined it in operation, to surpass, particularly from its simplicity, all the other improvements which have lately been introduced into the art of distilling; it requires less attendance than stills with the common head, and is under more control, as in case of running too fast, it can be easily checked; a quantity of fuel less than ordinary, is declared to be necessary to work it, and the whole charge may be drawn off without making any feints, without bringing over any of the gross oils, nearly 60 per cent. over proof. The spirits, it is asserted, are more pure at one distillation, than with three in the old mode. In malt distillery the saving is very great, as it appears that only one distillation is required, to produce very pure spirit, from the raw wash. This still is in use in Mr. Booth's distillery in London.



Reference to the Engraving.—A is the still, B the bottom box of the apparatus fitting on the still, *b b* a plate of copper fitting on the box, B; *c c c c* are open tubes through which the vapour ascends into the top box D, where the separation of the spirits from the aqueous vapour, takes place; the tubes *c c c c* project through the bottom plate of the box D, so that the oily and aqueous matters are not allowed to impede the fresh vapour from the still, but run back into the still down the larger corner tubes, *d d*, which are on a level with the bottom plate at *e e*; the lower ends of these tubes are turned up syphon wise, to prevent the ascent of the vapour from the still; C C is a stay

plate for the tubes; in the box B is a range of tubes *g g g* through which a jet of cold water is passed when the spirit is required very strong (but not generally used) having its egress and exit at *f h*; F is the pipe that conveys the spirituous vapour into the worm tube. The whole operation appears to be governed by the thermometer E; and that spirit of great purity will be obtained in this way, will be obvious to every one. [*Ib.*

FRANKLIN INSTITUTE.

Fifteenth Quarterly Report of the Board of Managers of the Franklin Institute of the State of Pennsylvania.

Philadelphia, October 18th, 1827.

THE period has now arrived when it becomes the duty of the Board of Managers of the Franklin Institute, to meet their constituents, and to present to them their Fifteenth Quarterly Report; a duty which, upon the present occasion, they perform with particular pleasure, as they anticipate that the information which they have to communicate, will be acceptable to the members generally.

The fourth annual exhibition was opened, in the Masonic Hall, on the fourth day of the present month, and closed on the eighth; in consequence of the inclemency of the weather, the committee of arrangement found it expedient to postpone its commencement one day beyond the time appointed. The committee of premiums and exhibitions, have obtained from the respective committees appointed as judges of the articles exhibited, their particular reports; an abstract of which is presented in their general report, which also contains the award of the premiums, in conformity with the conditions published in their last address.

The opinion heretofore entertained, of the utility of such exhibitions, has been strengthened, and confirmed, by the uniform result of the experiments which have been made; and although in the war of conflicting opinions and interests, excited by the preference which must necessarily be given to an individual, in deciding upon the respective claims of competitors, some are offended, and refuse again to enter the lists, new combatants appear, and supply their places, whilst time and reflection suffice, in general, to subdue that momentary irritation which disappointed hope is so apt to produce; and new exertions are made, on the part of many, who, for a period, thought of withdrawing from the contest. Although in the late exhibition, the manufacturers of goods of several kinds, neglected, or failed, to supply specimens of the productions of their establishments, there were many articles which were new, and a striking evidence was afforded, of great improvement in quality, and finish, in the kinds heretofore furnished.

The beneficial effects of the small charge made for admission, were universally felt and acknowledged. The rooms were well filled, without being so crowded as to interfere with a satisfactory examination of the various articles; and although members accompanied by

two ladies, and depositors of goods, had free admission, there was received for tickets at 12½ cents each, the sum of seven hundred and thirty-eight dollars, 21 cents. This small charge, therefore, whilst it suffices to keep out the mere idler, will also enable the Institute to extend its usefulness, by offering premiums for a greater number of useful products. The board have witnessed with pleasure the unremitted attention of the gentlemen who were appointed as managers of the exhibition. The task imposed upon them required extraordinary exertions and sacrifices, demanding the whole of their time and attention, not only during the exhibition, but also for several days prior, and subsequent to that period; the order observed, and the neatness and taste displayed in the arrangement of the whole, testified how faithfully they performed the gratuitous task.

The requisite arrangements have been made for the opening of the drawing school, and for the delivery of the lectures for the ensuing season. Mr. Hugh Bridport will continue his superintendence in the former department; his coadjutor, Mr. Haviland, has resigned, in consequence of his other avocations demanding his frequent absence from the city. The board, however, have a prospect of immediately filling the vacancy, by the appointment of a gentleman eminently qualified for the station.

Professor Jones will deliver his course of lectures on Mechanics, and Natural Philosophy, and Dr. Franklin Bache, his on Chemistry, with its application to the arts.

The lectures will commence on Tuesday, the sixth of November, when Dr. Jones will deliver an opening address, and on the Thursday following, Dr. Bache will give an introductory to his course of Chemistry; after which, Dr. J. will lecture every Tuesday, and Dr. B. every Thursday evening, at half past 7 o'clock. Saturday evening is reserved for volunteer lectures.

In the last quarterly report, the regulations adopted respecting the admission of boys, were made known to the Institute; at a late stated meeting, the Board resolved to issue tickets for the admission of ladies to all the lectures, at two dollars for the season. The practice of admitting females to attend the courses of lectures in Mechanics' Institutions has obtained in London, Glasgow, and other places, and has been found to produce all the good consequences anticipated from the measure; affording to those who are our earliest and most influential instructors, a mass of useful information, through the pleasing medium of rational amusement; whilst their presence stimulates to exertion, and tends to the promotion of order and decorum during the hours of meeting.

In the formation of new institutions, there are, generally, a considerable number of persons who enrol their names on the list of members with a view of affording temporary aid, without designing to become permanent subscribers; owing to this, and other causes, there has been a considerable number of resignations presented during the last recess; but there has recently been a large accession of new members, and the board confidently believe, that the places of those

who have retired, will be more than filled, by such as will consider themselves permanent supporters of the Institute.

The arched girders have been removed from the rooms in the first and second stories of the Hall, and pillars have been placed under the straight girders; by this means the most perfect security has been attained, and the rooms have been much improved in their appearance; the new arrangement will likewise, it is believed, give more distinctness to the voice when these rooms are used for public speaking, a purpose for which they are both intended.

The report of the Treasurer, exhibits a balance in hand of 1215 dollars, 39 cents; and it appears that a large amount remains due from delinquent members, and as it is desirable that a correct estimate should be formed of the annual income of the Institute, in order that the disbursements may be regulated accordingly, the board have resolved that it shall be the duty of the treasurer to report, at every annual meeting, the names of all such members as refuse to pay their arrearages.

Accepted by the Institute.

JAMES RONALDSON, *President.*

THOMAS P. JONES, *Secretary.*

On improving the Colours of Agates, and on an improved manner of using Florence Oil Flasks. By Mr. I. LUKENS, *Engineer.*

THERE are certain parts of agates which have the property of imbibing oil, and other fluids, in a similar manner with the Turkey oil-stone. Mr. Lukens having been applied to by a lapidary in the United States, to learn whether the colours of the common agates might not be heightened, so as to resemble some beautiful specimens he produced, availed himself of the above property, and accordingly caused several of the German agates to imbibe oil, by steeping them in it for two or three hours; he then wiped their surfaces clean from the oil, and placed them in sulphuric acid, which he put into a Florence oil flask, and heated over a charcoal fire, until sulphurous acid fumes were extricated in abundance. He then, after suffering the whole to cool, and washing off the acid with water, found that the agates had partially imbibed the oil, and that the sulphuric acid, in its turn penetrating them, had, by carbonizing the oil, considerably deepened the colour of those parts so impregnated with oil, had rendered the veins more white and opaque, and had thereby *very greatly increased the beauty, and consequently, the value, of the stones.*

Mr. Lukens has kindly repeated this experiment before us, and has likewise given us permission to make his process known to the public; and it may also be desirable to describe his very simple and convenient apparatus used on the occasion.

Instead of converting the Florence oil flask into a capsule, as usual, he perforates the side of it with an oval hole, large enough for the

introduction of the agates, thus leaving the neck of the flask to serve as a very convenient handle to lift and carry it by.

He perforates the flask by heating a part of it with a hot iron, and wetting it until a flaw is made, which, by means of the heated iron, he leads around in a proper direction to form the hole.

His furnace consisted of a small garden pot, about five inches deep, and four wide, and placed upon a larger pot, inverted; the hole in the bottom of the smaller pot being placed over that in the centre of the bottom of the larger one. He had also perforated the side of the small pot in several places, with holes of three quarters of an inch in diameter, by holding it against a drill, fixed and turned in his lathe. This pot he partly filled with charcoal, and then laying upon the charcoal a few fine wood shavings, and kindling them, he laid more charcoal upon the kindled shavings, and, by the help of bellows, quickly ignited the whole mass of charcoal. A thin metal plate, having a circular hole of three inches in diameter in its centre, and laid upon the top of the garden pot, thus converted into a furnace, supported the Florence flask and its contents, in a very convenient manner.

We like to record these cheap, very simple, and useful expedients, as they may serve to show how easily a chemical apparatus, necessary in a great variety of operations, may be formed, even of the commonest vessels, in the hands of a scientific individual; the whole cost of the apparatus would not, probably, exceed sixpence!

[*Tech. Rep.*

On Purifying Coal Gas. By Mr. WILLIAM MATTHEWS.

SIR—The art of gas lighting having now become, in a great degree, a national concern, every effort to improve it may be considered as an endeavour to benefit the public. But circumstances may perhaps have given me a predilection in its favour, as I happened to be one of those who had the pleasure of witnessing Mr. Murdock's splendid display at the Soho, near Birmingham, in 1802, and afterwards some of Mr. Winsor's exhibitions in London. As I then anticipated that its application would eventually be extensive, so I have attentively noticed its progressive advances, and have hailed, with no ordinary interest, every attempt, however trivial, that in the least degree conduced to its improvement.

At an early period of its use, the purification of coal gas was one of the chief difficulties that attended its processes; but these have long been obviated by the exertions of a few eminent and scientific men. I have seen an account of a process recently introduced at the Birmingham and Staffordshire gas works, on the principle of a patent lately obtained there; I sincerely hope that this improvement will prove to be *new*. But I presume you are aware that the purification of coal gas, by ammoniacal gas, has long been practised; for a patent for purifying coal gas upon this plan was taken out in 1817, by Mr. Daniel Wilson, of Dublin; and his specification, with a representation

of his apparatus, will be found in vol. xxxii. p. 11, of the Repertory of Arts. Perhaps the new method of purifying is an improvement on Mr. Wilson's. It is stated in a late periodical work, that "Mr. B. Cook, of Birmingham, recommended the use of lime in 1810;" but I have no recollection of ever reading, or hearing, of such a circumstance before; and if it be a fact, it has escaped my observation. I have reason to believe that Mr. Murdoch purified coal gas with lime, in various ways, twenty-five years ago; and Dr. Henry notices the washing it with lime-water, in his paper, published in Nicholson's Journal for 1805. Where, however, ten tons of lime per day are used, I am rather curious to learn; the Chartered Gas Works are on a larger scale than any other in the world; and, no establishment being conducted with greater ability, the skilful superintendents of that very extensive concern must, I presume, have read, with not a little surprise, this account of the quantity of lime, as well as some other things in that paper. But I am disposed to suspect that the patentee has been deceived by his informants; for, being acquainted with his character, I am confident he is too candid and honourable a man to publish, knowingly and intentionally, any exaggerated or erroneous statements. To excite attention to an important object; to correct mistakes, and, if possible, to obtain accurate information, are my only motives for writing the above remarks, and your insertion of them in your *Technological Repository* will oblige, sir,

Yours respectfully,

To T. Gill, *Esq.* W. Matthews.

[*Ib.*

ESSAYS ON LITHOGRAPHY.—No. IV.

Retouching Ink.

It sometimes happens, particularly in designs made with the pen, that the ink with which they are drawn, has penetrated the stone but slightly. In this case, as the printing ink, which is applied by the roller, does not adhere sufficiently to the slight drawing made upon the stone, an ink is used, called by the Germans, *Anneme farbe*, and which unites with, and penetrates more deeply into, the traces made so superficially on the stone. This ink is composed of equal parts of linseed oil, suet, and soap, half the quantity of wax, and a little lamp black; the whole is melted and mixed well together, and oil of turpentine added to it, when it is desired to make it more liquid. After having prepared the stone, and covered it with gum water, a little of this ink is taken, and, by means of a clean linen cloth, rubbed lightly over every part of the writing, or drawing, taking care that it does not cover those places on the stone, which are intended to remain white. The gum water does not prevent the ink adhering to the lines of the drawing, but it does not allow it to stick to those parts which are not covered by the lithographic ink with which the designs are made. If, notwithstanding

this, parts of the stone become blackened, the spots are removed by pressing on them with the end of the finger, or the palm of the hand, which has been previously dipped in strong gum water. The stone is washed with one sponge, and wiped lightly with another; it is then inked with the roller, and the impression taken.

On the Paper, and the mode of wetting it.

The kind of paper to be used in lithography, is not a matter of indifference, particularly when impressions are to be taken from a highly finished crayon drawing. The paper is the better for being thick and soft, especially if it swells, so as to prove elastic in the process of printing. The impressions come out best on unsized paper; that, however, which is thin, and sized, may be used for drawings in ink, or for writings. A waste sheet of paper is always placed on that which is to receive the impression; and when it is thin, even two are used, in order to produce an impression more perfect and regular. Sized paper requires to be wetted more, and to remain in that state longer, than that which is not sized; but it affords, in general, fewer impressions. That which is impregnated with lime, alum, or other substances of a similar nature, spoils the beauty of the impressions, and prevents the taking many of them. They are likewise injured by folds, and bulbs, in the paper, but more particularly by particles of sand: these last form lines on the drawings, cut the leathers of the presses, and make hollows in the scrapers, rendering them unfit for use. The paper ought to be of a uniform and regular texture, and thickness. In order to wet the paper, one or two sheets are taken at a time, by the two corners of one end, and drawn through a shallow tub, full of clear water; they are then laid carefully on five or seven dry sheets, and covered with an equal number; continuing thus alternately to place together wet and dry paper, taking more or less of one, or of the other, according to the nature of the paper. The whole is placed between boards, on which weights are laid, in order that the moisture may be equally diffused throughout it; more weights are added at the end of an hour, or, what is still better, the paper is put into a press. If it be desired to take an impression without delay, and there is no moistened paper prepared, some may be soon procured by damping one side of each sheet, with a sponge slightly moistened, and pressing the whole for a few moments. When the drawings are made with ink, the impressions may, on an emergency, be taken on dry paper; but in this case, it must be sized. The moistened paper of which we have just spoken, should remain under pressure for ten or twelve hours—it may be continued in this situation, for twenty-four hours; but if it remain longer, it will dry, and become mouldy. Whenever it is found that the impressions cannot be taken until the expiration of this time, the paper must be removed from the pressure, dried in the air, and wetted again when it is wanted for use. When the paper is too wet, it does not take the ink well, and yields inferior impressions, and, moreover, has the disadvantage of stick-

ing to the stones. Experience will soon teach the degree of moisture which ought to be given to the different kinds of paper which may be employed.

Manner of Outlining the Drawings upon Stone.

Tracing, facilitates and abridges the work; and it is indispensable when it is desired to produce a fac-simile, or to obtain, with the least trouble, a copy of a drawing, the impressions of which are wanted to stand in the same direction as the original. In this case, a transparent paper is taken, such as is known in commerce as *papier végétal*, or any other kind, that is free from those fatty or resinous substances, which may dirty the stone, by taking the printing ink. This paper is laid on the model, and the outline and other principal lines of the design are traced with a lead pencil, or, what is still better, with red chalk, which leaves more visible traces on the stone. The outline, thus obtained, is placed on the stone, which has been previously rubbed with a little spirits of turpentine, or slightly moistened with water; it is then covered with a sheet of paper, and subjected two or three times, to the action of the press. The lines made on the paper, will, by this means, be reproduced on the stone, and serve to guide the artist in his design. It is not necessary to endeavour to efface any of the marks of the crayon which may appear after the drawing is finished, as they will not injure the impressions in the least. When it is of no consequence obtaining the impressions in the same direction with the original drawings, and there is no press at hand, the outline may be obtained on the stone, by rubbing it, on the reverse side, with red chalk, or with plumbago pounded and sifted. It is then fixed on the stone with wafers, and the lines which are to be transferred to it, are passed over again with a blunt point. If it is wished to avoid colouring the reverse side of the outline, a sheet of tissue paper is interposed between it and the stone, which paper has been coloured with red chalk on the side which is to be placed next the stone. By so doing, and then tracing the outline with a point, it is made to appear on the stone. This mode may be employed for *fac-similes*, and for all kinds of drawing; it being only necessary to retrace the lines already made, either with ink or crayon, as is done with a point, or a graver, in working upon copper.

On the Precautions to be Observed in Writing, or Drawing, upon Stone.

When it is desired to write, or to draw with ink, immediately on the stone, either when the sketch has been obtained by transfer, or traced by hand with a crayon, we proceed exactly as we are accustomed to do when we work on paper, whether we use the pen or the pencil. We would remark, however, that practice and a certain lightness of hand are necessary, in order to make, with facility, neat and delicate lines on stone. Highly finished works should not be undertaken without previous practice. The ink takes better, and

spreads less, when the stone has been well polished, and rubbed with spirits of turpentine, or with water, a little soapy; the former, however, is preferable. When the stone is rather soft, there should be mixed with the spirits of turpentine, a little of the lithographic ink; and with this the stone is to be slightly rubbed with a linen cloth, until it acquire a grayish tinge. The artist should be provided with steel pens, pens for drawing lines, and sable pencils, of different sizes, according to the kind of work to be done; each person choosing that instrument, with the use of which he is most familiar. It is necessary in both cases, to have the lithographic ink, so thick, as that the lines made on the stone may be of a deep black, and still thin enough to flow with sufficient freedom from the pen. It should be about the consistence of thin cream. If it is too liquid, it may be thickened by rubbing in it a stick of ink; if, on the contrary, it is too thick, a few drops of water may be added to it, mixing them by shaking them together in a bottle. It is necessary to the beauty of the impression, that all the lines of the design should be drawn with the same intensity of colour. The ink often forms into a little mass on the end of the pen, in consequence of its thickness, or of certain particles which have rubbed up from the stone; it is necessary, when this is the case, to wipe the pen with a rag, or it may be sufficient simply to rub the sides of its point against the vessel which contains the ink. It is well also, always to try it on the edge of the stone, in order to avoid the danger of making thick, slovenly lines, in the design.

Beginners find a difficulty in making the ink flow, when attempting to draw on stone, with a steel pen, or a ruler; but this difficulty is soon overcome by practice and patience, if the instruments used are good. The use of the pencil is more easy, though less expeditious, than that of the pen. All that is necessary, is to keep it supplied with a small quantity of ink, and to work with a light hand, taking care not to repeat the strokes. When the ink has thickened in the pencil, it should be wiped, and fresh ink taken.

It is easy to perceive, that when it is desired to write on stone, the characters must be reversed, and the work done from right to left, in order to have the impressions in the direction of ordinary writing. This is an art which cannot be attained without a certain apprenticeship, while writing on paper with lithographic ink, may be done by all who know how to write.

Drawings in crayon do not require less care than those in ink. They ought to be executed with a free, bold, and strong touch. If the crayon be passed lightly over the stone, it will produce pale lines, which will often be lost in the printing; and it is in vain to endeavour to give strength and effect to these, by going over them a number of times: the succeeding touches, as well as the first, being made faintly, and with indecision, will fail to adhere to the stone, and will disappear, or become coarse and confused.

It is necessary to be very careful to work on stones that are perfectly clean, whatever may be the kind of design which it is desired to execute. Negligent workmen often neglect to wash the stones

carefully, so that they may be sometimes found covered with a slight coat produced by the material used in the polishing. It is necessary, also, to wash them well with a clean linen cloth, before using them, in order to remove the dust with which they may be covered. They may likewise be rubbed with a cloth, moistened with spirits of turpentine. A paper should be placed under the hand, so that it may never rest on the stone, and great care should be taken, that the design be not rubbed; in order to avoid the danger of this, the hand should rest on a wide ruler, supported by two little strips of wood, as has been before explained.

It is more convenient, when drawing with crayons, to cut a number of them before beginning to work, so as always to have some ready at hand, for which to change that in use, when it has become blunt, or has softened by warmth, without being perpetually interrupted in the work. Besides, if the crayons are cut over the stone, it may be soiled by the little fragments, which would adhere to the design, be broken up in the printing, and produce dark spots. Little pieces often become detached from the crayons, in the act of drawing, and may be discovered, by examining the stone against the light, in an angle of about 45 degrees. In this case, it is necessary to remove them carefully with the point of a knife. When these little pieces are perceived on the point of the crayon, they may be removed by turning the port-crayon round and round between the fingers, and rubbing the point of the crayon on the edge of the stone, or on some other substance.

When drawing on stone, it is necessary to be very correct; for every line once made, will be reproduced, unless it be erased, which it is difficult to accomplish. There is no other means of doing it, than by using the point of the scraper. If the drawing is in ink, the part which it is desired to correct, must be obliterated with the scraper; and in order to prevent the ink leaving any trace, it is sufficient that the stone should be cut very superficially, and without producing a hollow in it, or taking off its polish; but leaving it so that the new lines may be made on the same place. Those lines which are too thick, or ragged, are corrected by means of the same instrument.

The difficulty is greater in correcting a drawing in crayons, done on a grained stone; for if the grain has been removed with the scraper, it will not be found possible to use the crayon on those parts which have been thus polished. In this case, it is absolutely necessary to make use of the point of the scraper, or of some other sharp instrument; with this, those tints which are too deep and strong, may be softened, and the harmony of the different parts of the drawing, restored. Those parts which have been blackened by the crayon, may be removed by picking with a point, without injuring the grain of the stone. When it is wished completely to remove any part of the drawing, the point of a scraper will not answer the purpose; in this case, it is necessary to erase it, by placing some sand on it, and rubbing it about, with a mullar. The crayon is thus removed, without destroying the grain of the stone; and after having cleaned this

part with a brush, and rubbed it with a piece of linen, the drawing may be again made on it. The same method is employed, when, by accident, a spot of ink, of grease, or of saliva, has fallen on the stone.

ON GILDING.

We gave, in our last number, the French mode of gilding in oil, and we now furnish, from the same source, (the *Dictionnaire Technologique)* that of the ordinary gilding upon wood, such as is seen upon looking-glass and picture frames. We shall hereafter publish the method followed in England and in this country, which differs somewhat, though not materially, from the following.

On Gilding on Wood, &c. with water-size.

This branch of business requires a workshop which is equally protected from the intense heat of the sun, and from the extreme cold of winter. Low and moist situations must also be avoided, as the vapours which are generated in such places, such as the sulphuretted hydrogen, and ammoniacal gases, are peculiarly injurious. Those persons whose breath has a strong and disagreeable odour, ought not to attempt this kind of work.

The seventeen operations which follow, are necessary in this gilding, and some of them must be several times repeated; we shall describe them as briefly as the subject will admit.

1st, *Sizing.*—A good handful of the leaves of wormwood, and two or three heads of garlic, are to be boiled in a quart of water, until the liquid is reduced to one half; it is then to be strained through a cloth, and half a handful of common salt, and nearly half a pint of vinegar, are then to be added to it. The design of this composition, is to destroy the greasy nature of the wood, to prepare it the better to receive the coats which are to be laid on, to preserve it from being eaten by worms, and to kill any which may be there; this, mixed with a sufficient portion of good glue, boiling hot, is to be laid upon the wood, with a brush, the bristles of which are short.

When it is wished to gild plaster, or marble, the same composition is used, but without the salt, as in damp situations, this would produce a white saline efflorescence upon the surface of the gold. For wood, the salt is absolutely necessary. Two coats of this size are to be laid on, the first of which should be weak, that it may sink into the plaster, or the marble, and moisten it perfectly; the second coat should be of strong size.

2. *The White Coating.*—The wood which has been sized, is to have six, eight, or ten, layers of Bougival white, commonly called Spanish white *(whiting);* so that the faults in the wood, and in the carving, may be filled up; taking great care that the projecting parts be well covered with the white, as the beauty of the burnish on the gold depends much upon this. The following are the precautions necessary in laying on the several coats.

A quart of strong parchment size, and half a pint of water, are to be made quite hot; and to this are to be added, in small portions, two

good handfuls of the whiting, which have been passed through a fine silk sieve; this is left to infuse for half an hour, when it is to be stirred carefully, so that the mixture may be perfect; the first coat is to be laid on quite hot, dabbing it with the brush, in such a way, that it may not be thicker in one place than in another. The lower parts of the carving must be covered by dabbing in with a smaller brush: this first coat is not only to be laid on equally, but it must be thin, so that the wood may be seen through every part of it. The operation of dabbing with the brush, must be repeated in every successive coat, in order to unite the whole, so that they may form a single compact body. Experience has shown that when this is neglected, the whiting will scale off in separate layers.

The coats of white which follow that first laid on, are prepared in a similar way; the size, however, is used very strong, without the addition of water; it may be used cold, but the mixture must be well made. The last coat must be perfectly dry, before a new one is laid on; the quantity applied should be always equal, and the same strength preserved in the size; without this latter precaution, a strong, superior coat, will cause the weaker one below it, to scale off. The last coat should be laid on a little warm, and rather thinner than the others, brushing lightly to soften the work down.

3. *Stopping and Fish-skinning.*—After putting on one coat of white, and before it is followed by a second, the work must be examined, the lumps reduced, and the small hollows filled up; this latter is to be done by a cement consisting of whiting and glue kneaded together; after which, it is rubbed with fish skin, which will remove all the fibres of the wood.

4. *Stoning, and Smoothing.*—The whitened surface is to be wetted by the brush which is used for putting on the whiting; the water should be fresh and cool, and in summer a piece of ice should be thrown into it; only a small portion should be wetted at once, which should then be rubbed down with pieces of pummice stone, made flat for the parts which require to be of that form, and round, or hollow, as may be necessary for the mouldings; little sticks are used for clearing out those members of the mouldings, which may have been filled up by the whiting: the whitened parts are to be rubbed lightly, so as to render the surface smooth and even, to the touch. At the same time, a brush which has become soft, by using it with the whiting, is employed to wash out all the dirt which has been formed in the rubbing; the moisture is to be dried up with a sponge, and any small grains which may remain, may be removed by the finger; this operation is delicate and important; the whole work is finally to be wiped with a piece of clean linen. In the finishing operation, particular care must be taken that the square members and grooves are perfectly even, and that the corners are finished so as to form good mitres.

5. *Repairing.*—The work having been softened, stoned, and dried, is given to the repairer, to restore to the sculptured parts the fine and delicate cutting of the chisel; this is called recutting, and repairing. This labour ought to be performed by a skilful workman,

who is able to reproduce on the whiting, all the characteristic traits of the sculpture.

6. *Restoring.*—This is restoring to the whiting its original properties; which is accomplished by passing a moistened cloth over the parts which are to be matted, or burnished, and a soft moistened brush over those which have been repaired; then washing the whole with a soft piece of sponge, removing carefully, every speck, and every hair.

7. *Polishing with Rushes.*—The parts intended to be coloured yellow, are to be rubbed with rushes, after restoring, and drying; that is, all the even parts are to be smoothed by them, taking care not to rub off the whiting.

It has, for a number of years, been the practice to substitute *bas reliefs*, formed in moulds, for the sculptures formerly used, and which, when gilt, have the same appearance. The process of making these is the following: Moulds of plaster, or, which is better, of sulphur, are employed, which have the required figures in reverse; these, after being greased, are filled with a paste formed of whiting, kneaded up with size. This paste is to be strongly pressed into the moulds, with the fingers, so that a perfect impression of the sculpture may be obtained; that portion of the paste not contained within the mould, is to be removed with a straight, blunt edged instrument, which will leave the back surface even; the moulded part is then suffered to dry sufficiently to protect the figure from injury, but not so as to lose that flexibility, which is requisite to its being applied to a surface either convex, or concave. When thus prepared, it is to be glued in its place, pressing it down with cotton. The frames which are now manufactured, are all ornamented in this way, which is very economical, and produces a better effect than carved work, the figures being more uniform, and not requiring the operation of *repairing;* these moulded figures being affixed after all the preceding processes have been performed.

8. *Colouring Yellow.*—This is giving a yellow colour to the work prepared for gilding. Half a pint of parchment size is taken, which must be clean, white, and as clear as crystal, and of one half the strength of that used for the coating with whiting; this is warmed, and there is mixed with it, two ounces of yellow ochre, very finely ground in water; it is then left at rest, and the clear portion decanted, which gives a fine yellow colour; this is to be applied very hot, with a soft, clean brush, so as to cover the whole work. This application must be lightly made, so as not to disturb the whiting. The yellow tint serves to cover those deep recesses, into which the gold cannot be made to enter; it serves also as a mordant for the gold size.

9. *Graining.*—The yellow colour being dry, the whole surface is to be again gently rubbed with rushes, to remove all specks or hairs which may be found on it, and to give a uniform surface, without the slightest inequality.

10. *Covering with Gold size.*—The gold size is the composition upon which the gold is to be laid; it is composed of one pound of

Armenian bole, two ounces of red chalk, and a sufficient portion of English black lead, ground separately in water. The whole is to be mixed and reground, with nearly a spoonful of olive oil. The beauty of the gilding depends greatly upon the making, and the proper management of this size.

The gold size is tempered by mixing it in parchment size, which is clear and clean, and has been passed through a fine sieve, to remove all foreign matter. This, when applied, is made warm, and three coats of it are laid on with a small brush, the bristles of which are fine, and long; such brushes are made for the express purpose, with very soft hair. All the parts which are either to remain matted or to be burnished, are to be covered with the size, but it is not to be forced into the deeper parts.

11. *Rubbing.*—When the three coats of size are quite dry, the larger smooth parts, which are to appear matted, are to be rubbed with a piece of new dry linen; this will cause the gold which is not to be burnished, to extend itself evenly, and to appear brilliant; and the water to flow over the sized surface, without forming spots.

Upon those parts which have not been thus rubbed, but which are to be burnished, two additional coats of the same gold size are given; tempered in the same way, and to which a little water has been added, to render it thinner; the work is then ready for gilding.

12. *Gilding.*—A book of leaf gold is taken, the leaves are placed upon the cushion, cut to the required size, and applied in their proper places, by means of hair pencils of different sizes. The work is wetted with water, which must be perfectly fresh and clean, and which should be changed every half hour, and in summer, cooled by ice; the wetting is confined immediately to the part where the gold is to be laid; and the deep recesses should be gilt before the more prominent parts.

The leaf being deposited in its place, water is applied by means of a pencil, behind it, so that it may not flow over its surface, as this would occasion spots, particularly on those parts which are to be burnished; this water allows the leaf to spread, whilst its edge is to be supported in its proper place; it should also be breathed on gently; and the waste water removed with the point of a pencil, as it would otherwise dissolve the size, and the coats of whiting beneath it.

13. *Burnishing.*—That is, giving a brilliant appearance to the gold, with an instrument called a burnisher. This article has been described under the head of Burnishing. (Vol. ii. p. 290.)

14. *Matting.*—This consists in giving a light coat of parchment size to those parts of the gilding which are not to be burnished; this prevents the rubbing off of the gold. The size ought to be warm, but not hot; its strength should be half as great as that used with the yellow colour. It should be but once applied, allowing it to reach the deeper parts of the sculpture, which will mat, and retain the gold in its place.

15. *Retouching.*—It sometimes happens, in gilding, that there are small spots, on the deeper parts, which have been overlooked, or

from which the gold has been removed in applying the matting size; upon these places small pieces are to be put, by means of a pencil, after having moistened them with a small brush; when dry, each of these spots should be covered with a little size.

16. *Vermillioning.*—This consists in giving a brilliant red colour, which, by its reflection, produces the appearance of *or moulu.*

The *vermeil* is a liquid which gives to the gold a warm reflection, and causes the work to appear as if gilt in *or moulu.* The following is the composition used: two ounces of annotto, one ounce of gamboge, an ounce of vermillion, half an ounce of dragon's blood, two ounces of salt of tartar, and eighteen grains of good saffron: the whole is to be boiled in a quart of water, over a slow fire, until it is reduced one fourth. The liquor is then passed through a strainer of silk, or muslin.

A small fine pencil dipped into the vermeil, is to be lightly passed, with judgment and taste, into the indentations, and such other parts, where it will, by being reflected, give a good effect to the gold.

17. *Repassing.*—A second coat of the matting size is to be passed over the matted parts; this should be applied hotter than at first, and serves to bind and finish the work.

This is the manner of gilding in burnished gold, when the work is well performed. The processes which we have given are correct, and are all requisite, and indeed indispensable to perfectly good work. They are frequently sacrificed to ignorance or avarice, in order to save trouble, or to increase the quantity of goods produced; gilt articles of all prices are sold every where, but it is easy to discover those which have been executed under the influence of ignorance or of roguery.

Notice respecting Magnetic Polarity. *By* D. H. Barnes.

TO PROFESSOR SILLIMAN.

New York, April 16, 1827.

Dear Sir—Professor Eaton's demonstration, of the fact, that the fitful variation of the compass is caused by the magnetism of the card, gave us great pleasure, and the simple and efficient remedy which he has found, is no less honourable to himself than beneficial to the community. Mr. Patten, of this city, had discovered the same fact in a compass which he had proscribed as unsaleable, and laid by as useless. Trying this compass with its proper needle, we observed that in turning the compass slowly and steadily around, there was one point to which the needle would cling, until the compass was turned full ten degrees. The needle would then start off, suddenly, to the proper point, and traverse correctly until again interrupted by the point of attraction in the rim. The same compass was then tried with a *short* needle, which lay perfectly still, and pointed with the utmost exactness, while the compass was turned entirely round. While trying these experiments, Mr. J. Dodge of the Western High

School of Rochester, took the [iron?] window bar which lay near it, and placing it perpendicularly, found that the *lower* end was a north pole. He inverted the bar, and was surprised to find the *same* result, that is, the poles were *instantly changed by inverting the bar.* He invited me to try the experiments with him. I did so, and after verifying the fact of the instant inversion of the poles, by the change of the position of the bar, I was led to inquire at what degree of elevation this change takes place. There must be some point at which the poles first become inverted, and there must be some *neutral* point or medium between polarities directly opposite. The idea struck me so forcibly that I immediately set about a series of experiments, which produced the following results.

Experiment 1. An iron bar was laid on the meridian due north and south.

Result. It showed strong polarity.

Exp. 2. The *south* end was raised to the Zenith.

Res. No change took place. The needle at the bottom was steadily attracted as before.

Exp. 3. The top of the bar was carried over from the Zenith to the north point of the horizon.

Res. The needle was inverted.

Exp. 4. The *north* end of the bar was raised to the Zenith.

Res. The needle was inverted.

If then, the bar raised from the *south*, traverses through 180 degrees, and becomes inverted; and the same bar raised from the *north*, traverses through 90 degrees, and becomes inverted, the changing point must *divide the difference;* accordingly—

Exp. 5. The *north* pole was slowly raised, in the progress of which the needle quivered, became unsteady, and at 45 degrees was inverted.

Again, if the needle is *inverted* at 45 degrees there must be a neutral point, and this again must *divide the difference;* accordingly—

Exp. 6. The north end of the bar was raised to 22½ degrees;

Res. It exhibited no signs of polarity, being from end to end simply an attracting point to either end of the needle.

Exp. 7. The bar was laid due east and west, or at right angles to the meridian.

Res. It exhibited no signs of polarity.

I anticipated the next conclusion, that the change of polarity would *divide the difference* between 45 degrees and the commencement of the scale; accordingly—

Exp. 8. Giving the compass to Mr. Dodge, and holding the instrument to measure the angle, I raised the bar from the *east* 22½ degrees, and said, without looking at it, "now the needle is inverted." "True," said he, "so it is."

The curious and interesting result then is, that a plane elevated from the north, at an angle of twenty-two and a half degrees, and cutting the horizon in a line due east and west, is a *neutral* plane or magnetical *equator*, and that a bar revolved on this plane shows no polarity; and if the bar makes with this plane on the upper or *south*

side any angle equal to twenty-two and a half degrees or greater, the lower end is the north pole; and if the bar makes on the under or *north side* of the plane, a less angle with the plane of the horizon than the magnetical equator makes, the end which touches the equatorial plane is the south pole. Whether these results are uniform in various parts of the world, or whether there are such lines as magnetical *tropics*, on each side of the magnetical equator, as the above results seem to intimate,—whether the magnetical equator is the same in different latitudes, or varies its position according to latitude, future experiments must determine.

Dr. Gilbert has mentioned the fact, that opposite ends of an iron bar equally affect the magnet, and in the same way; and he accounts for the fact by supposing that the earth magnetises the bar instantaneously.

Is then the common remark, in the books, that a bar becomes magnetic by long standing in a vertical position, strictly true? And will not any such bar instantly change its polarity by being inverted?

Should any of these facts or experiments appear to yourself to be new or useful, they are at your service for publication in your valuable Journal.

Yours most truly,

D. H. Barnes.

We learn from Mr. Barnes, that at the time of writing his paper, he had not seen the remarks in our last number, (see page 42 of this Journal) signed, A Surveyor. He considers them as a covert and improper attempt to depreciate a valuable discovery, and as conceived in an improper spirit. In inserting them, we were not impressed with any other idea, than that a practical man was urging a fair criticism respecting an innovation requiring great caution, and which was therefore a proper subject of examination. We trust that it will be the means of producing additional experiments, and that in the end, the cause of truth—which should be the great object of all our labours—will be promoted.—*Editor.* [*Silliman's Journal.*

Denison's *Baltimore Patent Roofing Cloth.*

In an early number of this Journal, we inserted a letter upon this subject, and promised to procure further information. The patentee was not satisfied with his early trials, and was convinced that experience would enable him to produce the article in a more perfect form; but experiments of this kind demand time, as this is the only perfect test of durability. In consequence of an application recently made to us, we have had some correspondence with the manufacturer upon the subject, and have received from him a specimen of the roofing as now made, and, also, such information as he possesses, respecting its value. We subjoin the letter of Mr. Denison, as more acceptable than any thing we could say, particularly as it is

characterized by that candour which will bespeak the confidence of those who are uninformed respecting the high standing of the writer.

Baltimore, Oct. 13, 1827.

Dr. Jones,

Dear Sir,—I have received your polite letter relative to the roofing cloth, and am obliged by the interest you have taken in this matter, which is indeed a desideratum in the arts, or rather was one, for I am confident, that the cloth, as we now prepare it, will answer the purpose, and that effectually.

I am satisfied, both from my own experiments, and the attempts of others in the same way, that cloth prepared according to any of the methods heretofore known, will not resist the action of sun, air, and moisture, to which it must be exposed, unless it be frequently refreshed by some oily or other unctuous matter. We found that the roofs covered with the cloth as first prepared, would answer with the precaution of painting or varnishing it, once a year, at least, but not without. The cloth, as it is now prepared, so far as the experience of nearly a year's exposure can be any criterion, effectually resists the operation of the agents above mentioned, and appears, when examined after such exposure, not to have undergone any change; so that a duration of many years may be anticipated, because the influence of these agents of decomposition is progressive; and if their effects do not begin to show themselves in a year, we may safely conclude, that there is, in the matter with which the cloth is prepared, an inherent power of resistance.

The longest experiment of the new cloth, is an exposure of ten months, upon a large smoke-house, attached to a bacon establishment, on Market street, Fell's Point; which was covered on the 12th day of December last. The cloth has undergone no change, but a slight loss of freshness on the surface.

Other pieces have been carelessly laid upon a common shingle roof, so that the rain ran freely under and over them, and after remaining there between five and six months, they were found not to be in the least mildewed, or otherwise injured. The specimen sent was thus exposed for about three months.

There are several buildings covered with the new cloth, all of which answer, but the one above mentioned is the oldest experiment with the new cloth.

There are some eight or nine buildings, some of them large, as, for example, Mr. Buchanan's dying house at the Warren Factory; and three or four of my own, covered with the cloth as at first prepared, which answers, by observing the precaution above mentioned.

Independently of all this, when you come to be acquainted with the mode of preparing the cloth, last invented, you will find it altogether original, and from your knowledge in the arts, you will be satisfied, *a priori*, that it must answer the purpose. We can supply what Mr. P. may want at one dollar per square yard.

Yours, &c.

E. Denison.

We have left the specimen, above mentioned, with our publisher, Mr. Dobson, who will cheerfully exhibit it to those who wish to examine it. We should use it with perfect confidence. [*Editor.*

Remarks on Feeders for High Pressure Steam Boilers. By the Editor.

In the last number of Silliman's Journal, Mr. Doolittle of Bennington, Vermont, has given "A Description and Specification of a Hydrostat, or Apparatus, intended to secure a constant and uniform supply of water in Steam Engine Boilers," for which apparatus, it appears he has obtained a patent. We are at a loss to discover in what his contrivance differs from the old ball-cock, excepting in being more complicate, and, consequently, less useful. The hydrostat is a floating body which is placed on the surface of the water, and has two stems to it, which slide through holes in a frame The upper stem has a rack, which takes into the teeth of a pinion, fixed upon the head of a cock in the supply pipe within the boiler, and by the sinking of the float the cock is opened, and allows water to be forced in, by the force pump. On the outside, there is a waste valve, to admit of the escape of water when the cock is closed.

Every mechanic will see that this is a ball-cock; and every engineer is familiar with a waste valve; and knows, also, that a cock is a very uncertain instrument, when used for such a purpose, frequently getting out of order, and allowing steam to escape; valves should always be preferred in such cases.

In the Transactions of the Society for the Encouragement of Arts, &c., and also in Vol. II. of the Register of the Arts, a very ingenious apparatus is described, in which the float is made to act upon a valve, in a novel and ingenious manner. We know nothing of it in practice, but should prefer it to that described: the waste valve and tube are similar.

Many of our readers know, that an instrument, denominated a *tell-tale*, has been proposed to be added to steam boilers; it is so called, because the blowing out of the steam, through a trumpet-mouthed tube, is to give the alarm when the water has descended to a certain point. To devise a method by which this should be made to act, with certainty, against the obstacles presented by highly elastic steam, will be to confer a great benefit on the public, and great credit upon the inventor.

On a simple means of separating the Yellow Colouring Principle from Madder, and rendering it proper to afford the Red, Lilac, Violet, and Brown Colours used in Dying and Printing Wool, Silk, Cotton, and Linen. By Mr. G. H. de Kurrer.

The author states, that the treatises published by M. M. Kahlmann, Colin, and Robiquet, have determined him likewise to communicate a simple means of separating the red colouring principle of madder.

He had repeated most of the old practices, and especially that of M. Mérime. The object of these processes was, to wash the madder in order to separate the yellow colouring principle, but which also carried with it three-fifths of the red colouring matter. With a view to avoid this loss, M. Kurrer submitted the madder to maceration in pure water, and to the alcoholic and acid fermentations. He lastly washed it, until he found that the water from the washings no longer changed the colour of litmus. The madder which he obtained by this means had every desirable quality; but he found it so difficult to stop the acid fermentation, as to render the process not practicable on a large scale, and especially because this fermentation also, liberated a considerable part of the red matter.

The author finally submitted the madder to the alcoholic fermentation only, and immediately washed it. This process completely succeeded, and he applied it to all the varieties of madder, without meeting with any difficulty. The following is the description of the process:—

He employed three tubs, A, B, and C, which he placed near to each other, and in summer in the open air, under a hovel or open shed; but in winter he removed them to a cellar, the air of which he maintained at a temperature of about 18° or 20° of Reaumur.* The vessel A served to effect the fermentation in, and contained from 50 to 55 pounds of madder; it was two feet eight inches deep, and two feet six inches in diameter. The tub B, or washing vessel, was five feet and a half in height, and three feet in diameter; this was furnished with three wooden cocks, the first placed at two feet, the second at three feet, and the third at four feet above its bottom. The vessel C served as a deposit: its height was four and a half feet, and it had a cock placed at the height of a foot and a half above its bottom. In commencing the process, he placed in the vessel A, from 50 to 55 pounds of ground madder; he then added water, stirring the mixture continually, until the madder, when at rest, was covered with an inch and a half of water. He then left it at rest until the fermentation took place, and raised a crust of madder up to the surface, and which usually happened at the end of thirty-six hours, or, more tardily, in forty-eight hours, according to the temperature of the air. This is the favourable time for transferring the mass into the vessel B; and when this is done, that vessel is filled up with water; it is then suffered to remain at rest for two hours, during which time the madder precipitates. The first, or uppermost, cock is then opened, next the second, and lastly the third, and the liquor collected from the second and third cocks is carried to the tub C, in which it completes the precipitation of that madder which had escaped from the vessel B. He then continued to make two, three, or four repeated washings of the madder in the vessel B, until the washing water became no more coloured. The madder, thus purified, serves for dying, and in the manufacture of woven goods by all the known processes; but it is important, that in summer, the utmost care should

* Or from sixty-six to seventy degrees of Fahrenheit's thermometer.

be taken to prevent the madder from undergoing a second fermentation. The madder in the vessel c, after being washed and precipitated, is just as good as the other. We might, perhaps, employ the first liquor, separated from the fermented madders, with advantage, in the preparation of the heated vessels used in making indigo, or woad, as well as in the improvement of the madder. D. B. F.

[*Von Dingler's Polytec. Jour.*

Remarks by the Editor of the Technological Repository.

The Editor was some time since favoured by Dr. Dingler with some exquisitely beautiful specimens of calico-printing, produced in a manufactory in which he is concerned, and chiefly by the *discharging process*, now coming into such universal employment amongst us. The reds, pinks, and purples, were exceedingly pure and brilliant, and might possibly have been produced by treating the madder upon a plan similar to the above. At any rate, coming from such a quarter, and from so intelligent a judge as Dr. Dingler, this communication is entitled to the highest consideration amongst our dyers and calico-printers. The beautiful *self-green* produced from the chromic acid was first noticed by the Editor amongst these specimens.

Additional particulars of Mr. Perkins's High Pressure Steam Engine. By John March, Esq.

Greenwich, July 12, 1827.

Sir,—Having very recently witnessed at St. Catherine's Dock, London, the extraordinary power of Mr. Jacob Perkins's high-pressure, single-stroke, safety engine, I have the pleasure of stating a few important facts, reserving for myself a future representation of its additional advantages, my present observations having principally in view to explain some points which seem to have been much misunderstood, or, if observed, not to have been sufficiently appreciated. Indeed, it appears that the observations which the inventor has confidently made, long before the engine was first proved, have been nearly treated as mere assumptions. Any information, therefore, given to the public on so interesting a subject, will, it is presumed, prove acceptable.

The most important fact to be considered is the *perfect safety* of Mr. Perkins's *steam generators*, which may now with truth be declared to have wholly superseded the necessity of using boilers of any description, to which, however well made, must be attributed the fatal accidents so frequently recorded.

From calculations made with very proximate accuracy, it evidently appeared to me, that the quantity of water injected per minute was 266 cubic inches, being less than one gallon by 16-288ths, or 1-18th.

It becomes necessary to state, that the work to which Mr. Perkins's single engine was applied, was to pump water out of the dock

now constructing; to perform which, two double engines, on the principle of Boulton and Watt, are used; one of sixteen, the other of ten horse power. As the two engines required some repairs, they were stopped, and that of Mr. Perkins was applied to perform the same work, which it has most successfully effected, by keeping the water clear; thus doing, alone, a work equal to that of the two engines; that is to say, the work of 26 horses' power. Mr. Perkins's engine, in performing this, worked with a pressure of 35 atmospheres (equal, according to some, to 525lbs., but, according to Doctor Wollaston's more correct mean, equal to 490lbs. to the square inch), with a consumption, per hour, of only one bushel of a mixture of coke and coal; and the constant rate of the engine was sixty twenty-inch strokes per minute. The coke used, far exceeded the proportion of Newcastle coal. Now, on a reference to Mr. Watt's calculation, the quantity of coal used for a 26-horse power steam-engine per hour, is three bushels; and as we may fairly conclude that this single engine of Mr. Perkins performed the duty of two engines, together equal to 26 horses; so the reduction of two-thirds of the fuel may, by a parity of reasoning, prove to be a point of the highest importance; the advantage is still further increased through the use of coke. Indeed, from the peculiar construction of Mr. Perkins's generators, coke seems much better adapted than coal, which expends itself too readily, and before the caloric can have its full action. The smoke which is observed to issue from the chimney of most steam-engines, at every fresh supply of coals, is another evil, which will be obviated by the manner in which Mr. Perkins's generators are fixed, they acting in a great measure as smoke consumers.

I most attentively made my observations during the trial of this engine; and some share of experience enables me to say, that for an experiment (for it is only an experimental engine), it may be fairly pronounced to be as conclusive and satisfactory as any that has ever been made.

I am, sir, your most obedient servant,

JOHN MARCH.

To T. GILL, *Esq.*

[*Tech. Rep.*

Note by the Editor.—We have not received any late, direct information from Mr. Perkins on the subject of his engine, but have carefully selected whatever the public Journals have offered, the whole of which has been of a favourable character. The preceding account, is of nearly the same date with those given in our last number, and serves to corroborate them. We, however, have conversed with a gentleman just arrived from London, and whose judgment upon such subjects is second to that of very few persons, and who avers, that there has not yet been any fair test of the operation of the engine, and that it will eventually be found to fall very far short of the anticipations of its ingenious projector. We shall continue to present every thing which bears directly upon the question, until it is put completely at rest.

On the mischiefs arising from the employment of Fir, Pine, and Cedar, in packing Astronomical and Surveying Instruments, Time-pieces, &c. By THOMAS GILL, Esq.

MANY years ago, the Editor was shown a surveying instrument by its maker, Mr. E. Troughton, F. R. S. which had been sent to a hot climate, and was returned to him that it might be put into order, as it was covered all over with a *viscid coat of varnish*, which had entirely prevented the motion of the sliding parts of it; in fact, it required to be taken to pieces, to have its coat of securing varnish removed, and to be again fresh varnished, to fit it for use.

These evils were occasioned by the employment of slips of *cedar* in the packing, as it is termed, of the instrument in its mahogany box; and would prove, as he said, a salutary lesson to him, against ever employing so mischievous an article in future.

This fact has been lately recalled to the Editor's notice, by another, and a somewhat similar circumstance. Mr. I. Lukens being about to return to the United States, and having had a marine chronometer made, required a packing case to enclose the mahogany box, containing it; he, however, stated that he should carefully avoid the use of one made of *pine*, as a *volatile varnish* was disengaged from it, which would *thicken the oil* applied to the movements of the chronometer!

Of course, equal care should also be taken to reject the *shavings of fir, pine, cedar*, and other similar woods, which are ordinarily employed in filling up vacancies within and around packages, or the same evil results will certainly be experienced; and it shows from what seemingly trifling causes, the very worst effects, in respect to the performance of these and other delicate instruments, may be often produced. [*Ib.*

Fire produced by the collision of copper, &c.

ALTHOUGH great care is taken to exclude from gunpowder manufactories all articles of iron, and to substitute copper and other metals which will not strike fire, in the metallic parts of the machinery, yet it is well known that explosions, attended with disastrous consequences, are very frequent. Excited by an occurrence of this nature, *M. Aubert*, Col. of artillery, was induced, in conjunction with Capt. *Tardy*, to resume some experiments which he had unsuccessfully tried, to ascertain, whether gunpowder would not explode by the shock of copper. The result of these renewals was, that powder would inflame by the stroke of copper upon copper, or upon the alloys of copper. This gave rise to further investigations, in presence of the committee of safety, and it was ascertained that gunpowder could be exploded by the stroke of *iron* upon *iron*; *iron* upon *copper*; *copper* upon *copper*; *iron* upon *marble*; and by using the ballistic

pendulum, by *lead* upon *lead*; and with suitable precautions even by *lead* upon *wood*. The experiments were successful both with English and French powder. The experiments most clearly show, that in all the manipulations of a powder manufactory, all violent shocks and percussions should be carefully avoided, since they may occasion the disengagement of sufficient heat to produce the inflammation of powder. [*Bul. D'Encouragement, Juin*, 1826.

Useful Alloy, resembling Silver.

M. Frick in melting together 50 parts of copper, 31.20 of zinc, and 18.75 of nickel, obtained a metallic alloy, white, not oxidable, very ductile, and which acquires a beautiful polish; in varying these proportions, viz. by taking 53.39 of copper, 29.13 of zinc, and 17.48 of inckel, he produced an alloy which has the sound and unchangeable nature of silver, but harder. It is particularly suitable for ornaments, objects of saddlery, boxes, watch chains, &c. This alloy was sold at first at twelve francs per pound, but as nickel is sufficiently abundant in Germany, and as many artists are engaged in this composition, the price will necessarily fall. [*Idem.*

On the use of soapstone to diminish the friction of machinery: in a letter to the Editor of the American Journal of Science.

Boston, Aug. 6, 1827.

Dear Sir—My time and attention having been very much occupied with the duties of my profession, since I was at New Haven, I had almost forgotten your request, that I should communicate for your inspection, such facts as I could learn, relative to the use of steatite or soapstone, as a means of reducing the friction of machinery. I have observed in the July number of the *Franklin Journal*, a short article copied from the *Edinburgh Journal*, in which reference is made to this use of soapstone. The fact is simply stated, that "it facilitates the action of screws, and from its unctuosity, may be employed with much advantage, for diminishing the friction of the parts of machines, which are made of metal."

I understand that soapstone has been used for this purpose in the extensive manufactories at Lowell, for about two years, and with great profit and success. Besides answering the purpose to which it is applied, very much better than any other substance that can be procured, it saves a great deal of trouble and expense. It is first thoroughly pulverized, and then mixed with oil, tallow, lard, or tar, which ever may be the best adapted for the use for which it is designed. It is, of course, important to procure that which is free from *grit*; and it can be purified, in a good degree, by mixing the powder with oil, and diluting it, after it has stood a few minutes. The heavier particles will form a sediment to be rejected. It is used on all kinds of machinery, where it is necessary to apply any unctuous substance to diminish friction; and it is said to be an ex-

cellent substitute for the usual compositions applied to carriage wheels.

Some idea of the value of soapstone, in this use of it, may be formed from the following fact, communicated by D. Moody, Esq. the superintendent of the Tar Works on the Mill Dam, near this city. Connected with the rolling machine of that establishment, there is a horizontal balance wheel, weighing *fourteen tons*, which runs on a step of five inches diameter, and makes from seventy-five to a hundred and twenty-five revolutions in a minute. About a hundred tons of iron are rolled in this machine in a month; yet the wheel has sometimes been used from three to five weeks, without inconvenience, before the soapstone has been renewed. The superintendent thinks, however, that it ought to be more frequently applied.

This use of soapstone was discovered at Lowell, by an accident, the circumstances of which it is not necessary now to repeat. It is sufficient to say, that it is regarded by those who have used it, as an invaluable discovery. I have been assured that it has never been known to fail of producing the desired result, when applied to machinery which had begun to be heated, even in those cases where nothing else could be found which would answer the purpose.

Very respectfully your friend, &c.

E. Bailey.

[*Silliman's Jour.*

Improved Distilling Apparatus. By M. Marllard Dumiste.

M. Payen, in the name of the committee of chemical arts, has made a report on this apparatus to the Society of Encouragement.

The still is designed for the easy and economical preparation of aromatic liqueurs for the table. It consists of an ordinary alembic containing its wash, (bain marie) and communicating by the beck, or curved part of its head, with the upper extremity of a cylinder, which is divided into many receptacles by conic partitions.

The first of these receptacles is closed at its lower end by a cock; the second, immediately under it, the bottom of which is perforated with holes like a colander, is furnished with a filterer, composed of two woollen discs, between which a sheet of paper is introduced. This kind of filterer is placed over four other filterers, or receptacles of a similar kind, and finally the lower part serves as a recipient, to the bottom of which a cock is adapted, for drawing off the produce.

When it is desired to prepare an aromatic and sweetened liquor, by this process of distillation, the spices and alcohol diluted with water are placed in the wash; a proper quantity of sugar is then dissolved, and the sirop is poured into the upper receptacle of the cylinder. The distillation is performed with the customary precautions, and as soon as the necessary proportion of spirituous liquid has passed into the cylinder, which may be observed by a candle placed

at a proper height, the whole of the mixture of sirop and aromatic alcohol is let out into the filterers.

This mixture, in passing successively through the five filterers, becomes completely limpid, and the prepared liquor, without being decanted, may be drawn out of the recipient fit for use.

[*Bul. des Sciences.*

On the Laws which Govern the Power of Steam.

The following laws of steam were announced by M. Morin, in an interesting course of Lectures at Geneva, attended by philosophers as well as artists.

First Law.—Whatever may be the temperature and pressure under which the steam is produced, the same quantity of heat must be employed to produce the same weight of steam; and as the quantity of heat developed is proportioned to the quantity of fuel, it is obvious that a given weight of steam, a kilograme, for example, will always cost the same price, whether it be produced at a low or a high pressure. This important discovery is due to M. Clements, and is one of the finest results of his numerous investigations.

Second Law.—The volume of the same quantity of steam, is in inverse proportion to the pressure to which it is subjected. This law, discovered by Mariotte, is applicable to all gases. Steam acts, in many respects, as a permanent gas.

Third Law.—The dilatation of steam is $\frac{1}{267}$ of its volume at zero, for each degree of the centigrade thermometer. We are indebted for this law to the remarks of Gay Lussac and Dalton.

Fourth Law.—The latter gives the elastic force of steam, according to the degree of heat at which it is produced. The following table exhibits this law, which can be expressed only by numbers.

Pressure.	Centigrade.	Difference.
1 Atmos.	100°	—
2	122	22
3	135	13
4	145	10
5	153	8
6	160	7
7	166	6
&c.	&c.	&c.

Idem. Feb. 1827.

Dutch method of extracting Blue Colour from Woad.

The leaves are put together with water into a cask, and the mass loaded with weights. In this state they are suffered to remain for sixteen or eighteen hours, or until the saturation is complete, which is indicated by the water assuming a yellowish green tinge. The

leaves are then taken out, and the solution suffered to remain a few minutes, in order to precipitate its earthy particles; it is then filtered through a sieve of iron wire, horse hair, woollen, or silk, and afterwards stirred violently for a quarter of an hour, with a wooden spatula.

At this stage of the process, a quantity of lime water is poured into the extract, and the stirring is continued for some minutes longer, after which it is suffered to repose for several hours. At length a beautiful blue sediment will become deposited at the bottom of the vessel, and nothing further is requisite than to filter, and afterwards dry it in small heaps upon a wooden table, by the rays of the sun, in order to bring it to a marketable state. [*Bul. des Sciences.*

A mode of Preparing Paper which shall resist Moisture.

By M. Engel.

This process consists in plunging unsized paper once or twice into a clear solution of mastic in oil of turpentine, and drying it afterwards by a gentle heat. The paper thus prepared, without becoming transparent, has all the properties of writing paper, and may be used for that purpose. It is particularly recommended for passports, for the books of porters, and other labourers, and indeed is desirable for a great variety of purposes for which paper that is capable of absorbing damp, is very inconvenient. When laid by, it is perfectly secure from being injured by mouldiness or mildew, and is not likely to be destroyed by mice or insects.

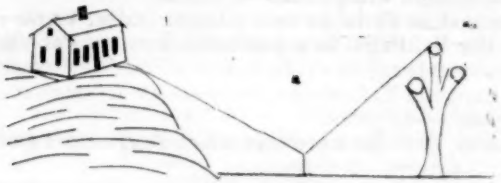
The inventor states, that a solution of caoutchouc, would produce a still better effect, but he does not say in what way that elastic gum is to be dissolved or diluted for use, or dried afterwards. This mastic paper has been used by printers, who have discovered in it the above mentioned qualities. By adding a little verdigris to the solution, the paper may be made to assume a greenish tint, similar to the paper known in Paris under the name of "*Papier de Cassabon.*" [*Bulletin des Sciences, &c.*

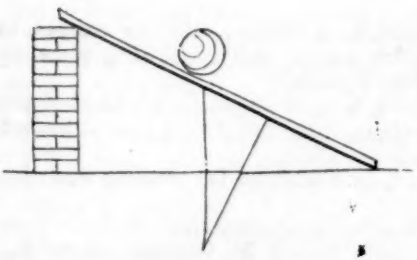
New Invented Apparatus for Expeditiously Drying Mildewed Grain.

This apparatus consists of two long concentric metal pipes, or tubes, winding in a spiral direction. The smaller pipe which is in the centre of the large pipe, forms a passage for the heated air, and the larger pipe receives the corn for drying, by means of a hopper attached to its upper end. The spiral shape of the larger, or conducting pipe, converts it into a long, inclined plane, in descending which, the grain is sufficiently heated to render it perfectly dry before it is discharged at bottom. [*Annal mens de l'Industrie.*

On Diagrams, and other outlines in Brass rule.

In our notice of Hales' Introduction to Carpentry, p. 212, we mentioned that the cuts in it, of which there are a considerable number, were all made of brass rule, by Mr. L. T. Jackson, of Brunswick, Maine; of these he has sent on three specimens, which we insert. They are much less complex than several of those in Mr. Hales' work, and are the first which were made.





The inventor has taken the preliminary steps, in order to obtain a patent, as they are likely to supersede wood cuts, where outlines are required, being made with greater facility, and less liable to injury. The section of the union in which the inventor lives, is one in which there is but little demand for such work, and we have no doubt that he would give the necessary instructions, and dispose of the right to use it, on very liberal terms.

French patents granted in the fourth quarter of 1826.

P. E. Kinkelin, Paris, for a system of inland navigation, upon an uninterrupted anchorage—15 years.

N. H. Maniclor, London, for the preparation called *vaxeme*, for making wax lights—15 years.

D. Rodier, Nimes, for a method of producing all kinds of figures on silks, wool, cottons, &c.—15 years.

J. Nicholson, Lille, for a new method of working bobbins, tubes, and other instruments, used in the preparation and spinning or twisting of all fibrous substances—15 years.

J. Walker, Paris, for making braces, girdles, and elastic garters, with double covered springs—15 years.

J. C. Dietz, Paris, for a steam engine and water pump, with metallic and elastic pistons, adapted to be used instead of horses, and to serve to propel vessels ascending canals and rivers, and applicable to the draining of marshes—5 years.

T. Dobree, Nantes, for the fabrication of felt for sheathing vessels —15 years.

Werdet, the father, and Miss M. E. Werdet, Paris, for a method of writing straight without lines—5 years.

M. Battendier, Paris, for an expanding leather trunk—5 years.

A. F. Berolla, Paris, for a pendulum, consisting of a figure which swings backwards and forwards, instead of from left to right—5 years.

J. A. Bart, and E. Dorleans, Paris, for an improvement in making optical glasses—10 years.

N. Charoy, Paris, for a machine called the spinner's guide, adapted to the mule jenneys—5 years.

J. B. B. Laignel, Lyon, for a system of navigation on rapid rivers —15 years.

J. P. Lelyon, Versailles, for a carbine, with four charges, having only one barrel, and which may be used as a fowling piece, by employing a different barrel—5 years.

J. Zuber & Co. Rixheim, near Mulhouse, for a method of printing with engraved hollow rollers, instead of by the present method—10 years.

J. B. Godart, Amiens, for a machine for combing wool, &c.—15 years.

J. Neale, Cernay, for a double pressure steam-engine—5 years.

C. Frederic, and his wife, Mrs. J. M. Gagnoux, Grenoble, for a loom for making nets with fixed square meshes—15 years.

A. Galy-Cazalat, and Capt. Dubain, for an impelling power, without machinery, to be used instead of steam in merchant vessels, and for its application to a fire-ship, which will not sink—10 years.

Mr. Cessier, Paris, for improvements in Panly's guns, having piston and *bascule*—5 years.

A. J. Lille Froment, and Mrs. L. B. Beaugnon, his wife, Paris, for a compound mastich, for taking impressions of oil and water colour paintings, on linen, paper, wood, metals, and stone; also, for a new process of copper plate printing, and for gilding, or washing with silver, without using mercury or fire; and for a machine for printing large pictures—10 years.

B. J. Dubost, Lyon, for a combination of steam engines, and the use of horses, in towing craft up rivers, &c.—15 years.

J. B. Wilks, London, for improvements in the evaporation of water for steam engines, and other uses—15 years.

J. H. Pape, Paris, for an improved piano, with a cast sounding board, and a new disposition of the hammers—10 years.

L. Roth, Sceaux-Penthievre, for a system of distilling in a vacuum, with or without fuel.

J. Cristofle, Paris, for a new method of making horn, or ergot buttons—5 years.

Chevandier, Paris, for a furnace in which small coal may be used, for drying wood, for the use of glass founders—5 years.

P. Joarhit, St. Etienne, for an apparatus for taking off the gloss from cloths, &c. by steam—5 years.

Miss F. P. Fournier, Paris, for improvements in children's whalebone pads and rollers—5 years.

P. N. Tastemain, Senouches, for a reaping machine—15 years.

A. Malbec, Paris, for a method of preparing the extract of milk, or milk for travelling—5 years.

H. P. Coiffier, Lyon, for a gilt alphabet of different materials and dimensions, for sign-boards, either on wood or glass, instead of the usual method of painting—10 years.

M. Middendorp, Paris, for an improved printing machine—5 years.

P. A. M. Chausonnet, Paris, for a method of making metal buttons in imitation of silk—5 years.

Gregoire, senr. and H. L. Gregoire, junr., Nimes, for a process and machine adapted to the machinery of jacquard, for making figured tulle and blond-lace.

V. L. F. Simonard, Lyon, for a machine for ascending rivers by the effect of the current—15 years.

LIST OF PATENTS FOR NEW INVENTIONS,

Which have passed the Great Seal from March 27, to May 19th, 1827.

To Aristides Franklin Mornay, of Ashburton House, Putney Heath, in the County of Surrey, Esq. who, in consequence of a communication made to him by a foreigner residing abroad, and of discoveries by himself, is in possession of certain improvements in preparing for smelting, and in smelting, ores and other substances, containing certain metals; or in extracting such metals from such ores and substances. Dated March 27, 1827.

To Matthew Bush, of Dalnonach Print Field, near Bonhill, near Dunbarton, North Britain, calico-printer; for certain improvements in machinery, or apparatus for printing calico, and other fabrics. Dated March 27, 1827.

To Bennett Wodcroft, of Manchester, in the county of Lancaster, manufacturer; for certain processes and apparatus for printing and preparing for manufacture, yarns of linen, cotton, silk, woollen, or any other fibrous materials. Dated March 31, 1827.

To Henry Aspray Stothert, of the city of Bath, founder; for certain improvements on, or additions to ploughs. Dated April 4, 1827.

To John Paterson Reid, merchant and manufacturer, in Glasgow; for an improvement or improvements on power-looms, for weaving cloth of various kinds. Dated April 4, 1827.

To Joseph Tilt, of Prospect-place, in the parish of St. George, Southwark, in the county of Surrey, merchant; who, in consequence

of a communication made to him by a person residing abroad, is in possession of certain improvements in the boilers used for making salt, commonly called salt pans, and in the mode of applying heat to the brine. Dated April 4, 1827.

To Edward Cowper, of Clapham-road-place, gentleman; for certain improvements in printing music. Dated April 5, 1827.

To James Shudi Broadwood, of Great Pulteney-street, Golden-square, piano-forte maker; for certain improvements in Grand Piano-fortes. Dated April 9, 1827.

To James Whitaker, of Wardle; for certain improvements in Machines, or Machinery, for pressing Cardings from Woollen or other Carding Engines, and for drawing, shibbing, and spinning Wool and Cotton. Dated April 24, 1827.

To Carlo-Glugo, of Lyons, in France, but now residing in Fenchurch-street, in the city of London, loom-manufacturer; for certain improvements in Weaving Machinery. Dated April 24, 1827.

To Morton William Lawrence, sugar-refiner; for improvements in the process of refining Sugar. Dated April 28, 1827.

To Joseph Anthony Borrollas, of Surrey, watchmaker; for a detached Alarum Watch. Dated April 28, 1827.

To Robert Daws, upholsterer; for certain improvements on Chairs, or Machines, calculated to increase ease and comfort. Dated April 28, 1827.

To Thomas Breidenback, of Birmingham, in the county of Warwick, merchant; for improvements in certain parts of Bedsteads. Dated April 28, 1827.

To Benjamin Somers, M.D.; for certain improvements on Furnaces for smelting different kinds of metals, ores, and slaggs. Dated April 28, 1827.

To William Lockyer, brush-maker; for an improvement in the manufacture of a material or materials, and the application thereof to the manufacture of Brushes, and other purposes. Dated April 28, 1827.

To Henry Knight, clock-maker; for a Machine, Apparatus, or Method, for ascertaining the attendance to duty of any watchman, workman, or other person; which machine, apparatus, or method, is also applicable to other purposes. Dated April 28, 1827.

To John M'Curdy, of Cecil-street, Strand, in the county of Middlesex, Esquire, who, in consequence of a communication made to him by a certain foreigner, residing abroad, and discoveries made by himself, is in possession of an invention of certain improvements in the process of rectification of Spirits. Dated April 28, 1827.

To John Brown and William Dudderidge Champion; for a certain composition or substance, which may be manufactured or moulded into bricks, or into blocks of any form, for building; and also be manufactured and moulded into, and made applicable for all internal and external ornamental architectural purposes, and for various other purposes. Dated May 5, 1826.

To David Bentley, bleacher; for an improved Carriage Wheel. Dated May 8, 1827.

To Thomas Patrick Coggin, of Wadworth, near Doncaster, machine maker; for a new or improved machine for dibbling Grain of every description. Dated May 19, 1827.

NOTICES.

To Correspondents.—We have read "A Practical Mechanic" with much care, and are at a loss to perceive how his condenser is to operate. If he will supply us with a sketch, which will enable us to understand his propositions a little better in detail, they shall receive that attention which they may appear to merit.

The promise to which "A Mechanic" alludes, has not been forgotten, and will soon be fulfilled. We have waited for some promised details which are much needed.

A subscriber has suggested that the natural and economical history of the cotton plant, one of the most valuable staples of our country, would be very interesting. We will prepare a paper on this subject, and shall be obliged by the communication of any facts, which may aid us in the work.

The paper on the Mechanical Powers has been received,—it will be reserved until we obtain some cuts for "The Artisan," when it will appear, and the subject be pursued.

Mechanics' Institutes.—The editor of the London Mechanics' Magazine, is preparing a general history of Mechanics' Institutes, and is desirous of obtaining such information, general and particular, respecting those in the United States, as will enable him to notice them according to their merits; we wish to aid him, in his laudable undertaking, and shall be obliged by communications from officers, or others, attached to such establishments, containing a concise history of their rise, progress, objects, and success. By Mechanics' Institutes, we mean all those associations which have been formed for the diffusion of useful knowledge, among manufacturers and mechanics, by whatever name they may be known.

The Franklin Institute, is about to commence those active operations which pertain to the season of the year. The opening lecture will be delivered by the professor of Mechanics, on Tuesday, the 6th inst. Dr. Bache's Introductory on Thursday, the 8th, and the lectures on Mechanics and Natural Philosophy, will be continued every succeeding Tuesday; and those on chemistry, and its application to the arts, every Thursday. Tickets for ladies, admitting to all the lectures, may be obtained at $2 each, on application to the Treasurer, Mr. S. V. Merrick, back of St. James's Church, North Seventh Street.